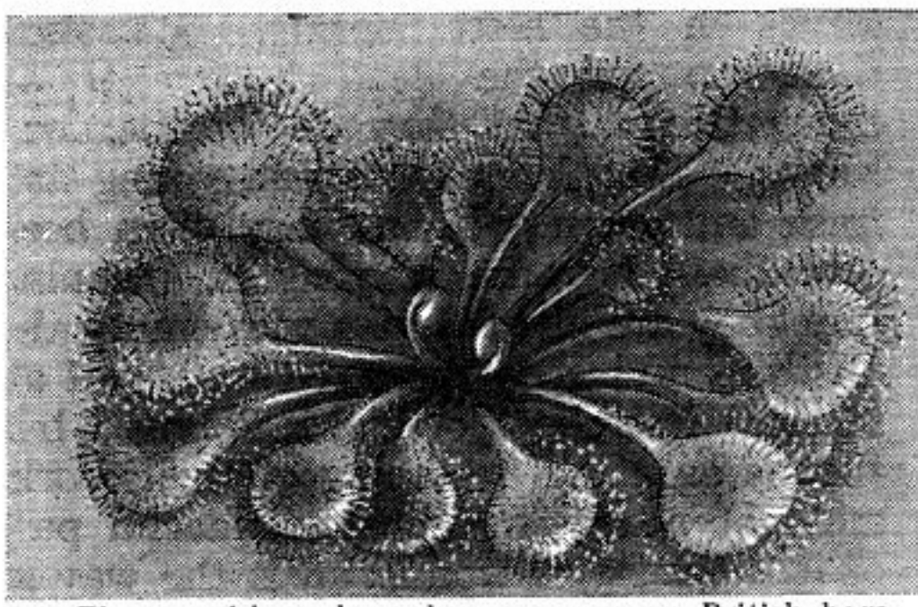
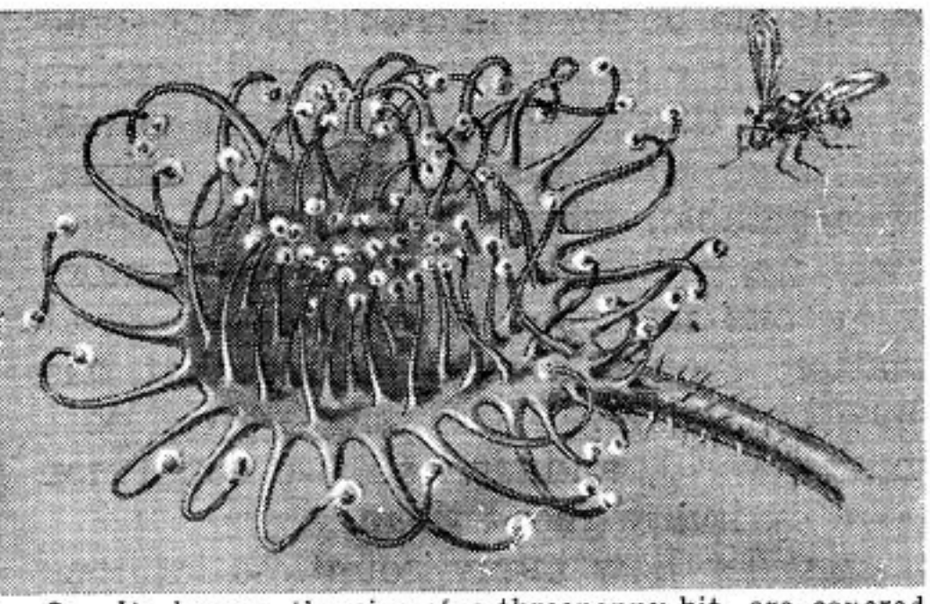
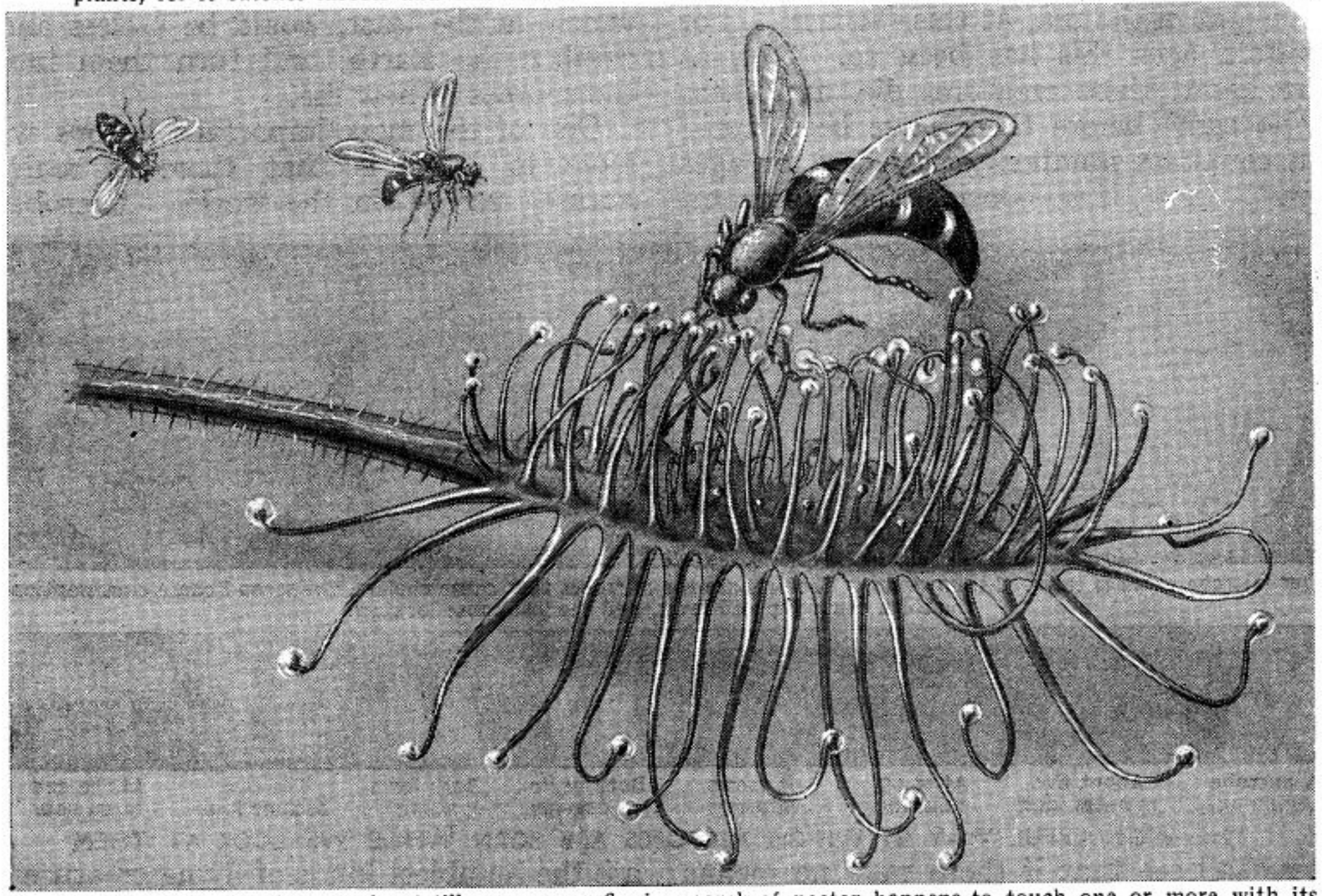
A BRITISH PLANT THAT EATS AN INSECT



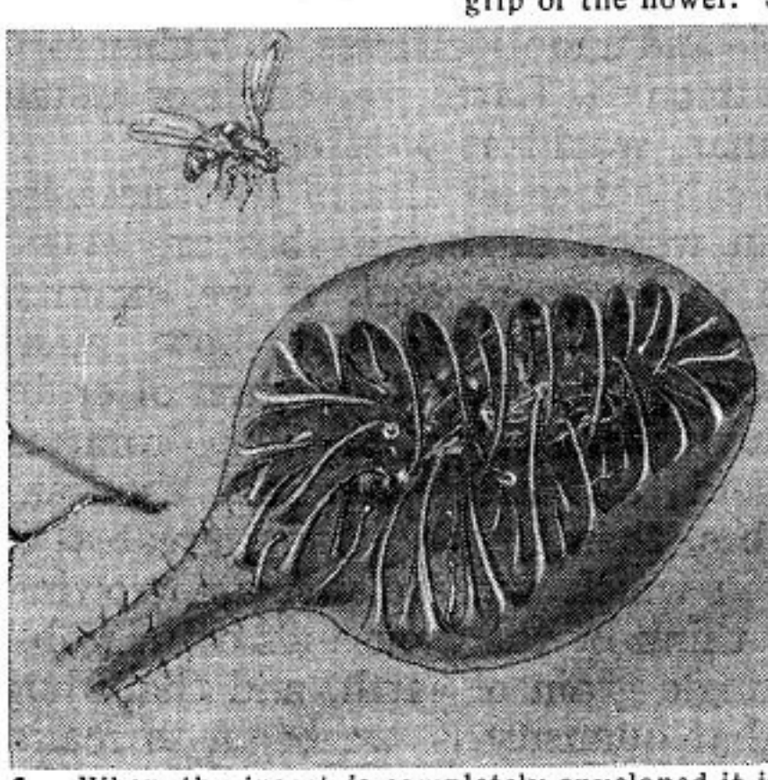
1. The round-leaved sundew, common on British bogs and heaths, is one of the most interesting of our native plants, for it catches insects and eats them.



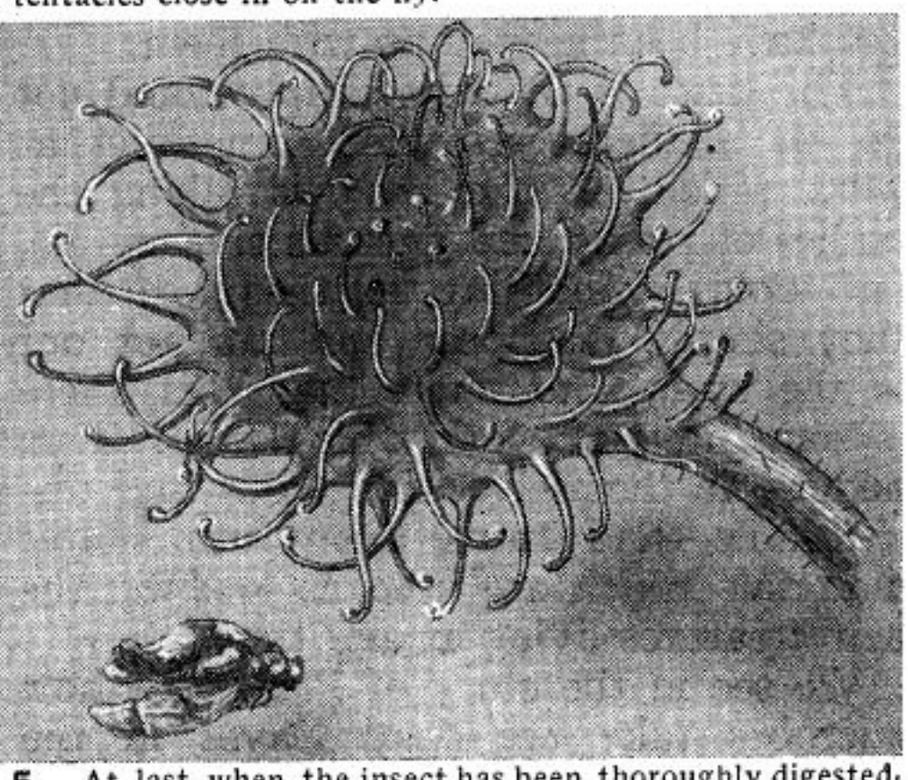
2. Its leaves, the size of a threepenny-bit, are covered with about 200 hair-like tentacles, clubbed at the end and covered with a sticky substance that glistens in the sun.



3. The tentacles remain spread out till an unwary fly in search of nectar happens to touch one or more with its antennae. At once it is held and the more it struggles to free itself the more hopelessly it becomes involved in the grip of the flower. Slowly the tentacles close in on the fly.

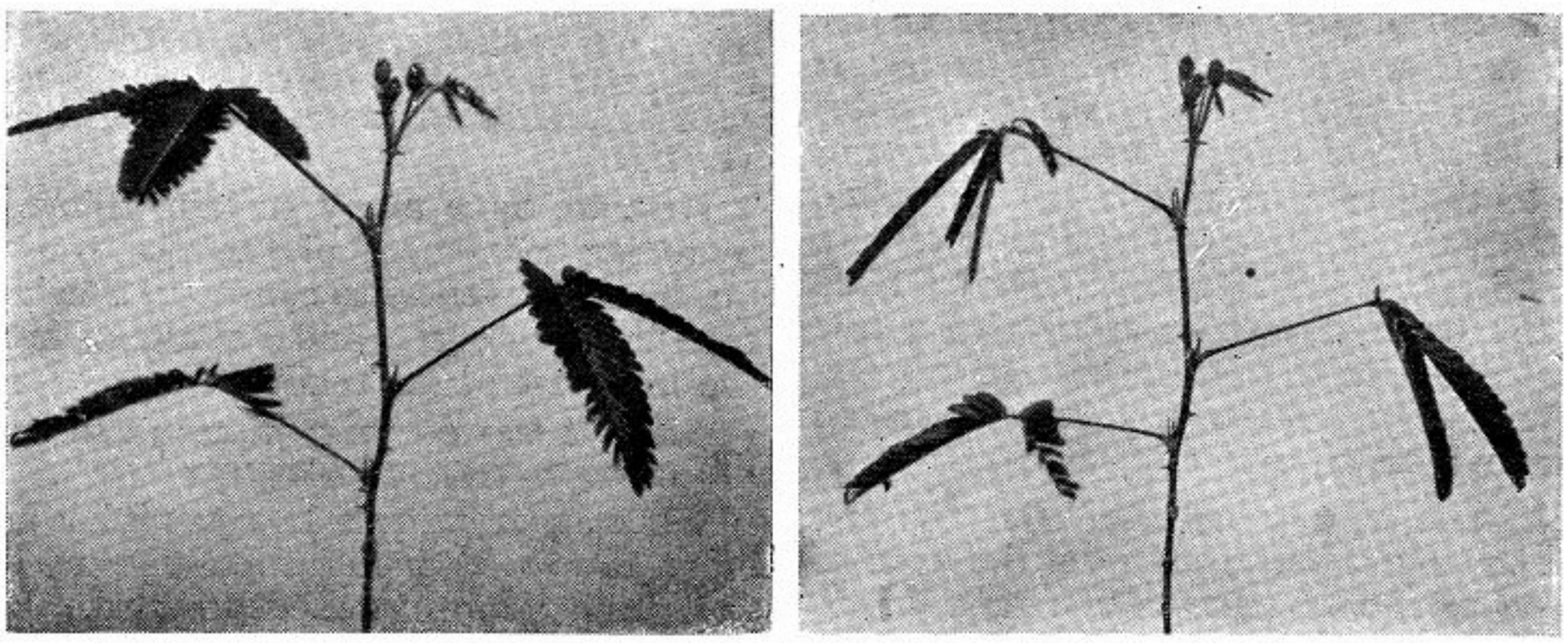


4. When the insect is completely enveloped it is suffocated in about a quarter of an hour, and acids from the leaf help the plant to digest it.



5. At last, when the insect has been thoroughly digested, the tentacles open and the remains are dropped or blown out by the wind. A sundew with 233 flies has been seen.

The Story of the Marvellous Plants that Cover the Earth



The Sensitive Plant whose leaves close up at the slightest touch, as shown in the right-hand picture

HOW PLANTS MOVE AND FEEL

Some of the simplest plants, which are single cells, so small as to be seen only under the microscope, swim about by means of living lashes, just as many of the simplest animals do. On the other hand, there are many animals, such as sponges and corals, which have no sort of locomotion except in their earliest days.

Yet, when we have allowed for the travelling activity of some single-cell plants and the standstill habit of many animals, the big fact stands out that plants are usually fixed, while animals are usually free. Plants expend little energy in locomotion ; animals spend much.

It is important to avoid extreme or fanciful statements in this connection, for while plants retain a power of movement in many of their parts, they have nothing corresponding to the muscles of animals ; and while plants often show an exquisite sensitiveness to changes in light and warmth, to gravity and moisture, and even to touch, they have nothing at all like a nervous system.

It is altogether a mistake to use words like sagacity or intelligence in speaking of plants ; what we are sure of is that they show a sort of feeling, even an *irritability*, and a shrinking away, as it were. They answer-back to outside influences, and a tree may respond even to the shadow of a passing cloud. They also move part of their body in an effective way. If we go on to say that plants must have something corresponding to man's mind, we may be right ; but we have passed beyond a point at which science can prove what we say.

The stem of the giant bamboo may grow a foot in a day, and a naturalist reports that he saw with the naked eye the growing of a bamboo in Java. Growth means increase in size ; the amount of the living matter is added to, and there is a *redistribution of material*. The growing units or cells are very *tense*, for there is a pressure on the cell-wall exerted from within by the watery living matter and the cell-sap. The living matter just inside the cell-wall controls the give-and-take between the cell-sap and the cell-wall, and thus controls the tenseness.

Everyone knows the limpness of a shoot that has been cut off from its water-supply ; it is worse than a punctured tyre. It is losing water into the air and gaining none back ; its cells lose their tenseness and the shoot withers. If we put the cut end into water before the withering has gone too far, the shoot will become stiff once more.

Professor Bower compares the relation of the tense cell-substance and the resisting

cell-wall to the relation between the bladder of a football and the leather skin. When the bladder is blown up, the outer skin is firm and rigid; when the air is withdrawn from the bladder the outer skin is soft and limp. But in the case of the football the pressure is gaseous, while in the case of the plant-cell the pressure is fluid. It is worth while to dwell a little on the tense state of growing and active plant-cells, for the movements of growing parts, and of full-grown parts, depend on changes in tenseness.

Charles Darwin detected the bending and bowing of seedlings. On the apex of a growing shoot he fixed a fine glass bristle with a bead at the tip, and from time to time he registered the position of the bead on a horizontal glass plate above the plant. He found that the tip of the shoot does not grow straight up; it bends and bows to the different points of the compass.

The movement is very slow, but it goes on whenever growth is going on; and it is due to the fact that the growth does not take place equally all round. What comes to the same thing is that there are changes in the tenseness of the growing cells in different parts of the shoot; and these seem to depend on the constitution of the plant, not on outside changes. They are movements from within.

THE TWINING AND COILING MOVEMENTS OF THE SENSITIVE TENDRIL

Of great use are the movements of tendrils, for they attach the plant firmly but elastically to its support, and help to pull it up. The tip of the slender green lasso of the bryony in the hedgerow moves slowly round in a circle, and this increases its chance of touching some support. If the under surface be rubbed a little, the tendril grows faster on the opposite side. Dr. MacGregor Skene describes what follows:

> As the tip curves, new points come into contact with the support, and the stimulus is thus constantly renewed, so that the tendril goes on twining round the support until the whole of the free tip has been used up.
>
> The coiled part hardens and becomes woody, clasping the support firmly. The long, straight portion, between the support and the base of the tendril, twists into a tight corkscrew, reversed once or twice—for a thread fixed at both ends cannot be forced into a spiral, without at least one reversal in the direction of the hoist—and then becomes woody.
>
> The corkscrew is of great mechanical importance. Did the free part of the tendril remain straight, any gust of wind, or shock from a passing animal, would throw a great, perhaps a breaking, strain on it. The tight spiral acts as a spring. If pulled, it opens out a little, to contract again when the pull ceases, bringing the plant back to its original position, and avoiding a rupture.

Here we have many striking things: a searching movement of the tip; an exquisite sensitiveness to contact; a twining round the support; and a spiral coiling of the free part of the tendril.

HOW THE TIP OF THE GROWING ROOT IS SENSITIVE TO GRAVITY

When a seed sprouts, however it has been lying, the young shoot grows upward and the young root grows downward. It is their nature so to do. If the seedling starts rightly, and is then turned upside down, it will soon have its root growing down once more, and its stem growing up. Of course, it may come about that the root's tendency to seek moisture may be strong enough to counteract the tendency to grow toward the centre of the Earth.

Very careful experiments have shown that the root's sensitiveness to gravity is situated at its very tip, and that this affects the area of most rapid growth a little higher up. It is the living matter of these quickly growing cells that answers-back by altering the direction of growth. In the tip-cells of the root there are starch grains which normally settle on the lower side of the cell. If the root-tip is forcibly pointed upwards, the starch grains will change their position, and some botanists think that this pulls the trigger of the answer-back. If so, the starch grains might be compared in this respect to the tiny particles of sand or lime found in the ear cavities of many little creatures. When the animal is suddenly moved, these particles in the ear have also to move; their movements affect nerve-endings in the ear; and the animal *answers-back*. In any case, what is certain is that the tip of the root is sensitive to gravity, and that the root adjusts the direction of its growth if it is interfered with.

THE THIRSTY ROOTLETS OF TREES THAT INVADE A DRAIN-PIPE

From a beautiful well a clay drain-pipe led away the water for use elsewhere; but every year or two there was a blocking of the pipe and a flooding at the well. There was nothing for it but to dig up the pipe, and then it was seen that string-like rootlets of adjacent trees had got in at the joints, or through tiny holes. Inside the

THE GLORY OF THE GRASS

Here our artist shows us a spike of meadow fox-tail grass as we see it with the naked eye, and the flower as it looks through a magnifying lens. A glume, or husk, is shown on the point of opening, and we see the feathery stigmas (or female parts), and the anthers (the parts of the male organ called the stamen which bear the pollen)

COCK'S FOOT GRASS

RYE GRASS

OAT GRASS

UPRIGHT BROME GRASS

WALL BARLEY

QUAKING GRASS

The grass family exceeds all other plant families in the number of its individual plants, and in its wide distribution over the Earth. Grasses range from the Equator to Spitsbergen in the North and to the extreme tip of South America in the South. Nine out of every ten plants in the world are grasses. Here we see the marvellous colour and beauty of various grasses of the field as seen when we penetrate their inner recesses in the microscope.

TIMOTHY GRASS

FLOTE GRASS

DARNEL

TUFTED ARIA

CANARY GRASS

REED GRASS

Grasses are mostly fertilised by the wind, and, in order that their pollen may be easily shaken off to be carried from plant to plant, the anthers which bear it are suspended on the most delicate filaments. The slightest breeze sets them in motion, and a field of grass, or a prairie, is like the sea: it is never still. The grass responds to the faintest puff of wind, yet the fiercest hurricane cannot destroy it, for it bends but does not break.

THE COMMON REED AND PART OF ITS MANY-FLOWERED HEAD GREATLY MAGNIFIED

A SPIKE OF COUCH WHEAT-GRASS ON THE RIGHT AND THE FLOWERS MAGNIFIED ON THE LEFT

As all these pictures show, the flowers of the grasses are alike in two things. Their pollen-bearing anthers are suspended on very fine supports, which can be moved by the slightest wind, and their stigmas have a feather-like form, so that they may easily catch the pollen as it falls upon them.

pipe the invaders branched out into a remarkable mass almost like tangled hair, and the result was a block of the pipe.

Now the interesting point was that the roots grew from a considerable distance to the water-pipe, following the increasing dampness in the soil, and that they found their way into the water almost as if they were boring animals. There is no real reason for supposing that the roots were consciously aware of the water at a distance, or that they " made up their minds " to reach it ; all we are sure of is that roots are sensitive to moisture and grow toward it, altering the direction of their growth according to the conditions in the soil around them.

Plants grown in a window turn towards the light, and they would become lopsided if the flower pot were not turned round. It seems a very sensible thing to do, to spread themselves so that they get the most of the light which comes in. But what the plant does is done automatically ; it is due to inequalities of growth. The stem grows less rapidly on the more illumined side, for light has a delaying influence on growth. This is just the opposite of the influence of heat, which hastens growth, as we see in hothouses. Now, if the growing part of a shoot in a window grows less rapidly on the side next to the light the result must be a bending towards the window.

LITTLE LENSES LIKE EYES IN THE SURFACE-CELLS OF SHOOTS

It is interesting to watch a growing shoot of ivy—to notice that it bends away from the light. Moreover, before it attaches itself, it gives off brownish aerial rootlets, and these are all toward the shaded side. This is obviously all the better for gripping a wall or a tree. The same is well seen in the fixing discs of the Virginia creeper, so that it is not necessary that a shoot structure must grow toward the light ; it is, indeed, occasionally the other way. It has been suggested that the surface-cells of the growing shoot sometimes act like little lenses, concentrating the light on the more living growing cells within. If so, they would be rather like the very simple eyes of some backboneless animals.

So that plants answer-back to gravity, to moisture, and to light ; and their answers are seen in movements of their growing parts. There are other influences to which plants are sensitive, such as electricity, chemicals, and even air. If plants have not what we call senses, they have at all events an exquisite sensitiveness to outside influences.

Another point of importance is that a change in the growth of a part of a plant may become stereotyped when the part becomes older, and therefore stiff. Thus some peculiarity stamped on the growing portion may last throughout life. It remains as a record of something the plant has experienced ; it is a dint from without, not an outcrop from within ; and it does not seem likely that it can be handed on as such to the next generation. But if the same peculiar influences play on the children plants, then they will show the same answers-back as their parents.

THE MOVEMENT AND FOLDINGS OF THE "SENSITIVE PLANT"

So far we have dealt with sensitiveness and movements in growing plants, or, we may say, in parts which are still young. Let us pass to sensitiveness and movements in full-grown parts.

Thus the beautiful three-bladed leaves of the clover and the wood-sorrel are spread out during the day, but folded downward at nightfall. This may protect them from over-cooling at night ; but it is not very clear. Similarly, many flowers, like daisies, close up at dusk ; and others, like the yellow sorrel, when the day is dull. Most attention has been given to the sensitive plant, which has its beautiful feathery leaves expanded horizontally during the day, but folded up like a closed umbrella in the evening. The opposite leaflets of each division of the compound leaf fold their upper surfaces together ; the divisions of the compound leaf seem to huddle together instead of being like an expanded fan ; and the leaf-stalk sinks from a more or less erect position and hangs downward at a sharp angle. The same remarkable movements may be brought about in a minute by shaking the plant, and we know that they are due to changes in the tenseness of cells at the hinge of the leaf-stalk, or at the base of each division of the leaf.

MESSAGES THAT TRAVEL BY DELICATE TUBES FILLED WITH SAP

If we pinch a leaflet at the tip of one of the divisions of the leaf we can follow the message. One pair of leaflets after another may be seen folding together, and finally the leaf as a whole droops down. There is evidently the handing-on of an

influence from one part of the leaf to another part at a considerable distance, and it may be from one leaf to another. It is probable that the message travels by long delicate tubes filled with sap surrounded by a delicate sheaf of living matter.

WHAT HAPPENS WHEN THE BEE VISITS THE CORNFLOWER

Professor Bower compares what happens to a wave of pressure in a rubber-tube filled with water. "If one observer pinches one end of the tube (he says), the stimulus is felt by an observer at the other end." If we are asked why a gentle touch to the tense cushion at the base of the leaf-stalk should make the leaf sink down, we may answer that there is a rapid change in the tenseness of certain cells in that position; but why the touch should produce the change in tenseness we do not know. We can only say that the living matter is irritable.

In the cornflower there is a neat movement of the stalks of the five stamens which surround the pistil. They are united by their anthers and curved outwards between these and their base of attachment. When a bee visits the cornflower and touches the sensitive hairs of the stamens, the curved stalks straighten and contract, drawing the anther tube downwards. The effect is to brush out the pollen on to the bee's body, and the insect is thus in a position to dust another flower which has its stigma expanded. In this case there is sensitiveness to touch, and a real usefulness in the change.

THE CAPACITY FOR MOVING AND FEELING THAT A PLANT HAS

On sunny slopes where the soil is loose we often see the rock rose, a low-growing plant with beautiful yellow flowers. If we touch the numerous stamens when the flower is basking in the sun, they exhibit a very marked movement which, perhaps, helps to dust the insect-visitor's legs. The flowers of the barberry have also irritable stamens, and there are other cases. It looks as if the capacity for feeling and moving was always lurking in the plant, ready to be used should occasion arise.

In the flower of the musk the sensitiveness is in the stigma, the tip of the pistil, which has two lobes and gapes like a mouth. If you touch this stigma with a piece of grass the two lobes close together, and this is what happens when pollen-grains are dusted by an appropriate insect-visitor. The closing of the lobes ensures that the pollen is not lost.

The opening of flowers such as daisy and goatsbeard when there is sunshine, and their closing when it is dark or cloudy, may be of use in protecting the stamens and pistil from rain and cold; and, of course, there will not be many insect-visitors about in darkness or bad weather.

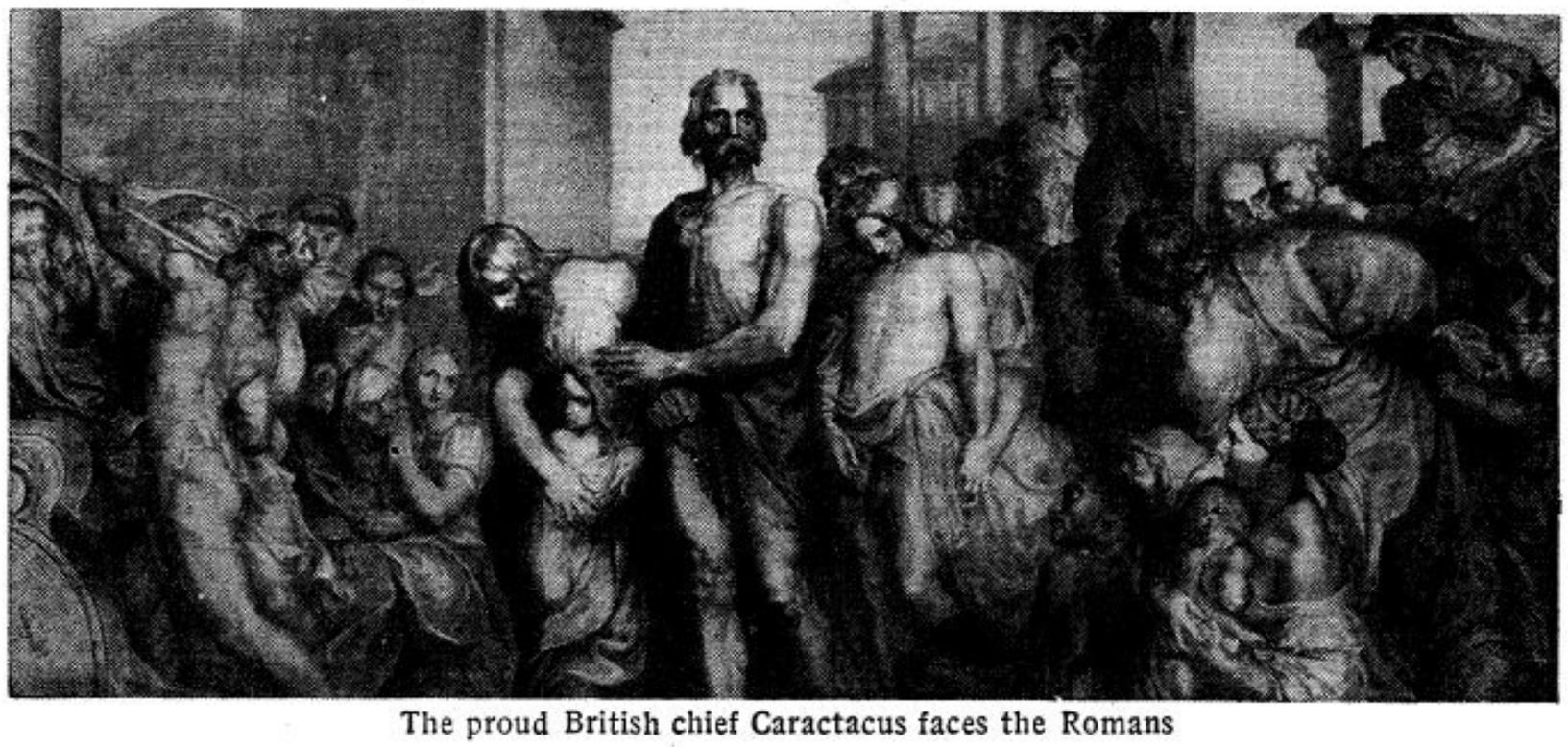
In the case of the crocus and the tulip, and of some other flowers, it is the heat and not the light of the Sun that pulls the trigger of the movement. In some cases the opening and closing movements have been registered in the constitution of the plants. Thus the marigold opens in the morning and closes in the evening even when it is kept in darkness. *An internal rhythm has been established as part of its nature.*

THE FINGERS OF THE SUNDEW THAT CLOSE ROUND THE INSECT LIKE A FIST

It has been already admitted that we are not very clear as to the usefulness of all the known movements of plants. One of the best illustrations of this is the Indian telegraph plant, which grows in the basin of the Ganges. Its leaf has a main leaflet which is stationary, and two small ones which describe circles with jerky movements. There are also almost constant movements in the leaflets of wood sorrel.

The beautiful reddish leaves of the sundew, which often grows among bog-moss on the moor, bear numerous radiating tentacles, both sensitive and mobile. Each tentacle bears at its tip a dew-like drop of insect lime which entangles the legs of small insects. The tentacle is stimulated by touch, but this requires to be confirmed by the chemical influence of the victim. When one tentacle is touched a message travels down it and influences other tentacles, which slowly curve inward. What looked like an outspread hand with many sensitive fingers becomes like a closed fist. Digestive juice is secreted round about the victim, which is then absorbed. After a while the tentacles expand again.

Still more striking is the Venus fly-trap of Carolina. If the fly-trap has been induced to shut on something it does not want, it opens again quickly, and when it has been cheated two or three times in rapid succession the plant ceases for a time to respond. Perhaps this is the nearest to Mind that a plant ever gets.



The proud British chief Caractacus faces the Romans

ENGLAND IN THE LONG AGO

THERE are some stories of which we never tire, and among them are those that we like to hear when we sit round the hearth, and the dancing firelight plays on the faces of those who are our home-makers. As the stories flow on, we step for a while into the quiet land of yesterday.

And what about the times before yesterday? What happened in them? What about the people of the far-off Past? We know, in a way, that life has been going on in these British Isles for many years; most likely some great names belonging to them stand out for us. We realise, too, as we look about us or study pictures, that buildings such as Westminster Abbey, the great cathedrals, the Tower, and many now ruined castles and churches scattered all over the country were the work of the men of bygone days. We can piece together the story of those days by looking carefully at the work and relics that have come down to us from them, and by reading in books and letters the descriptions of the times in which their writers lived.

By these means we can follow a written history of this country of ours back for nearly two thousand years.

Perhaps you may think the twenty centuries which hold our country's written history a long enough time to look across, filled as they are with stirring deeds and great changes. But if you wish to peer farther back, and ask who were the very first men who lived in the country that is now ours, we must go back through ages of unknown length to seek them.

The very oldest things found in this country are some roughly chipped stone tools, which dropped from the hands of the men who made and used them when this island home of ours was not an island, but was part of the continent now called Europe. Wild animals, as well as wild men, could therefore roam about as they pleased, with neither English Channel nor Irish Sea, as they are now called, to stop them.

The poor, rough tools, found in the gravel beds or drift of old rivers, are ranged in numbers round the upper shelves in the Prehistoric Room in the British Museum; it is called prehistoric because the times to which they belong were before written history began. The owners of these tools looked out on a Thames whose opposite banks were as far apart as Hampstead and South London are today.

What became of the Drift Men, or the Cave Men who followed, we do not know. The Cave Men's tools are better made and in greater variety; there are harpoons to catch fish, arrow-heads to shoot birds, and

bone needles to sew skins together, besides the sharp pear-shaped weapons for defence or for hunting.

The most interesting things the Cave Men left behind are their drawings and carvings of the animals they saw before them; the great long-haired mammoth as he crashed along, the reindeer fighting, the oxen feeding, are all sketched from nature. Many specimens of these drawings are found in the caves of France and Spain; we read of them in our study of Art.

The Earth rolled steadily on through space year after year, century after century, and at last, as the ground sank in some places and rose in others, the sea rushed in over the lower levels and formed what is now called the North Sea, the English Channel, and the Irish Sea, and Father Thames shrank to a mere shadow of his former great size. After this men appeared again in this country from over the sea now that it was an island; many different tribes followed each other, the newcomers pushing the others northward and westward, even across to Ireland and to Scotland.

NECKLACES THAT WERE WORN IN ENGLAND LONG AGO

As we look back to the far-off times of these settlers we find them very dark. They have left us no names, no writing. Perhaps the great stones set up at Stonehenge were used by them as a temple; perhaps they were set up about seventeen centuries before Jesus, that is, more than thirty-seven centuries—3700 years—ago!

The long and rounded grave-mounds, called barrows, still to be seen in many parts of the country are also believed to belong to the peoples of these times. In them are found skeletons and burnt bones, together with the rougher cups and vessels you can see in the museum below the Drift Men and Cave Men's tools. Sometimes a little child had a whole barrow to itself; sometimes many people are buried together. The ornaments, brooches, and necklaces found in them will interest us; also the tools of bronze found often in spots where they are supposed to have been made. In these early metal factories lumps of copper and tin, of which the bronze is made, often lie side by side with old tools to be re-melted and made into new ones. Then there are iron tools which gradually came into use as time went on.

We get a few scattered beams of light on these times from the visits of some travellers who came chiefly to look after the tin found in Cornwall and elsewhere. When they reached home they did what many travellers do today: they wrote books about what they had seen. These were copied into other books, and in this way we hear of the barns in which corn was stored, the rich, sweet drink that the natives offered them, and so on.

THE BOOKS OF TRAVEL THAT JULIUS CAESAR WROTE

A few centuries later, in the first century B.C., a great light suddenly lit up the country in which we have been groping. By its help we can now see plainly the people who lived in it. The nations who lived on the shores of the Mediterranean Sea were very different from the Britons and other tribes living in the islands set in the wild Atlantic. They traded with each other; some were very learned; some produced the most beautiful temples and sculpture, as well as the bravest men, the world has ever seen. One of these Mediterranean nations had succeeded in conquering all the others, so that it was master of the whole of the then known world. This was the Roman nation and a great Roman soldier who stands out in this first century B.C. was the light-bearer.

As we study the calm, determined face of Julius Caesar we find out what made him so powerful. He could make himself do what he believed to be best, as well as he could control others. He was always at work, conquering and settling his conquests, looking after his soldiers, and yet he found time to write books about his travels, which our schoolboys read now when they begin Latin. He gives many particulars about the Britons and their relations, the Gauls.

WHEN BRITONS AND ROMANS LIVED SIDE BY SIDE

He did not conquer Britain; he visited it with his army two summers running, and described it to the civilised Roman world, who kept it in mind till a hundred years later. Then they were able to send enough soldiers to meet the warriors with faces stained blue to terrify them, to disperse the chariots with scythes on their axles, to take the hill-camps fortified with stakes and logs of wood, and in time to subdue all the country of the plains.

Little by little many of the Britons were swept farther and farther west to the high moors of Cornwall, to the mountains of Wales and Cumberland. It is to these

THE ROMANS BUILD A HOUSE IN KENT

A ROMAN GENERAL DIRECTING THE BUILDING OF A GOVERNOR'S HOUSE BY THE DARENT, WHERE THE FOUNDATIONS STILL LIE BENEATH THE GRASS

parts we turn, especially to Wales, to find the people whose forefathers were mainly Ancient Britons, and to find echoes of the language spoken by them. It was here, too, that the old religion of the Britons, with the white-robed Druids, lasted longest.

Scattered all over the country, but chiefly in Wales, we find place-names that come from British words meaning a wood, a rock, a plain, an island, a waterfall, and many others more or less connected with the soil. Numbers of the Britons settled down, as time went on, among their Roman masters, from whom they learnt many things. Some helped the soldiers to drain the marshes and cut down trees, and to make the fine roads which crossed the country, and are still a pleasure to use, so well and straightly are they laid.

BOADICEA, QUEEN OF ENGLAND, AND THE BRAVE CHIEF CARACTACUS

Two great British names stand out in this first century A.D. Perhaps you know the statue of Boadicea, queen of one of the British tribes, which stands on the Embankment, by Westminster Bridge? With all her might she resisted the Romans, who had treated her very cruelly. Caractacus was another great British chief. He not only lost everything, in spite of his brave resistance, but was also taken prisoner to Rome with his wife and children. He did not behave at all as a frightened captive, but proudly, as a free-born king, said to the Roman emperor: "You fight to gain the whole world, and to make everybody your slaves. I fought to keep my own land, and for freedom."

For nearly four hundred years Britain was part of the Roman Empire. Great generals like Agricola came to push the conquests even further; he built a line of forts between the Forth and the Clyde to keep out the wild mountaineers of the north—built it along the very valley that is today crowded with coal and iron mines, factories and ports, fine farms, and thousands of workers.

Emperors came and went; we see their faces in the Roman Portrait Gallery in the British Museum, and one may read the stories of where they stayed, and how they built walls to keep out invaders.

The remains of the wall between the Solway and the Tyne are still to be seen; a railway runs in that direction now, and the name is still before us when we speak of Wallsend coal, found at the end of the Roman *vallum*. Other Roman names on our maps still show where the *castra*, or camps, were raised to house the soldiers at Chester, Lancaster, Leicester. A colony was settled in Lincoln, and many places are called Street from their position on or near the great *strata*, or roads. Stratford is an example of this.

WHAT THE ROMANS LEFT BEHIND NEAR THE EDITOR'S HILLTOP

The thousands of soldiers who came during these centuries from every part of the empire—the British lads were sent just as far away—left many remains on the soil of the country in which they worked so hard. Many of these remains are now in the great museums of the country, especially in the cities founded by the Romans—in London, York, Colchester, Winchester, and Bath. There are the altars they set up to their gods; their weapons and armour; the tablets to show long and faithful service, which gave them their discharge from the army; the memorial stones put up in their honour.

Many treasures of money and jewellery, perhaps buried in a hurry when danger arose, and never reclaimed, have been found among the foundations of cities, along the line of the walls, and on the sites of the beautiful country villas. The Editor of the Children's Encyclopedia has found coins of Constantine in his garden, where Roman soldiers probably dropped them; and he has dug up Roman tiles and bricks and mosaic flooring in a field near his hilltop in Kent. The Roman houses were built in the sunniest and healthiest places, generally with a fine view, in gardens with fountains and statues.

LIFE IN THE CITY THAT LIES BENEATH OUR FEET

We can well picture the life in these villas, as we look at the fine pavements, the shoes of the ladies and children, the lamps, writing materials, mirrors, and other treasures found buried among their ruins. Some of the pottery and glass were made in Britain, for the Britons were quick to learn, but the finest came in through London.

London rose to be an important city in Roman times. Some twenty feet below the pavements of the City of today, so thronged with busy feet, we find the remains of its greatness. Strong walls were built for its protection. Perhaps you have noticed how many stations have the word gate in their names—Aldgate, Moorgate, Ludgate, and so on, and from these

gates in the walls started the great roads which passed over the country to connect the City with Roman stations at Lincoln, York, Chester, Bath, Chichester, and many others. Traders, therefore, found it a convenient spot to bring the goods they had for sale, especially as there was then, and for many years after, a short cut for their ships from the Channel by the streams that surrounded the Isle of Thanet.

PIRATES FROM OVER THE SEAS WHO CAME TO ENGLAND IN BOATLOADS

The time came—probably in the third century—when the Romans as well as Britons began to give up worshipping the gods of their fathers, and listened to the preaching of Christian missionaries; so that there arose British churches and bishops. The country improved in many ways—more corn was grown, trade increased, and it seemed as if Roman law and order, and the liking for fine and comfortable lives, had all come to stay.

But this was not to be. In Britain itself troubles thickened as the Picts and Scots became more and more daring, and pirates from over the sea landed on the east and south coasts. Year by year, as the spring came round, fresh boatloads landed on the most desirable spots they could find, and took by force whatever they needed. In other parts of the great empire troubles thickened too, as fierce tribes poured over its distant borders and made their way towards the beautiful and wonderful capital itself. The only thing to be done, as the Roman empire grew weaker and weaker, was to give up the most distant provinces and recall the soldiers who held them to defend those nearer home.

THE ROMANS LOSE THEIR POWER AND ABANDON BRITAIN

So the Romans had to leave the walls they had built, the cities and camps, with the theatres and baths, and the castles—such as those at Richborough and Reculver which guarded the way to London. There must have been many a sad good-bye, for often Romans had British wives and relations, and the departure of those who had helped to make the country so prosperous must have sown despair in the hearts of those left behind to cope with the difficulties and dangers as best they might. They had so long been taken care of that they had forgotten how to make plans for themselves and fight all together.

Listen to a letter they sent to Rome, asking for soldiers to come back and help them; it is so sad that it is called "the groans of the Britons."

> The barbarians drive us to the sea; the sea drives us back to the barbarians. We are either slain or drowned.

Many sad relics of this time are found in the caves, where families took refuge when their homes were destroyed. Thus it was that the light shed over Britain by the presence of the civilised Romans went out as the last boats carried away the last soldiers across the Channel.

The wild Picts and Scots burst over the now undefended wall, and burnt what they could not carry away back to the hills; the sea-rovers who had been coming year after year to settle and stay, came ever thicker and faster. They burnt the villas and towns, destroyed the camps, starved London to death because trade was stopped, and provisions could no longer come in by the land and water-gates from the roads and the river.

OUR FIERCE, FAIR-HAIRED, AND BLUE-EYED FOREFATHERS

Once more Britons had to flee to the mountains in the west, and those who were left behind became the servants of the heathen new-comers, if they could not manage to stay on in their farms as owners.

We want to find out all we can about these new-comers, for it is they who are the fierce forefathers of our race. Great changes have taken place, as many generations have been born, have lived and died, during the fifteen centuries between their time and ours.

But still, as a nation, we keep up a family likeness, and in many ways take after our great-grandfathers. Many of us are as fair-haired and blue-eyed as these sea rovers were; we love the sea and adventure, though in a quieter way, as much as they did. Half the words in our language—all the everyday words—come from the speech in which they shouted directions to each other as they shipped their oars and grounded their boats on these shores.

Besides all this, and much more, most of our laws, our ways of governing, our customs, have grown through the centuries from those they brought with them, together with the passionate love of freedom which we inherit from their old homes across the North Sea.

There were long, cold winters on those flat and sandy shores round about the south-east corner of the North Sea whence the newcomers into England came in their long boats.

The meadows by the marshes, the dark woods behind them, could not afford enough food for the people who lived in the homesteads around ; for, as time went on, more and more tribes of the same family of nations pushed nearer to the sea, till all were overcrowded. So it came to pass each spring, " when the birds began to twitter in the sunshine and the brooks and rivers ran gaily singing to the sea," that some of the youngest and strongest of the people set out to find new and more roomy homes, where they could hunt and fish, and where they could grow corn in order to feed their families.

NAMES STILL ON OUR LIPS AND WRITTEN ON OUR MAPS

Truly a desperate sight it must have been for the poor guardians of the shore in Kent or elsewhere when the long, narrow boats, with imposing figureheads, came swiftly toward them. In most cases resistance was useless. The tall, strong men, with flowing hair and bronzed faces, glittering swords and shields, leaped ashore one after the other, and before long were masters of some desirable piece of land, if possible near the mouth of a river or in a sheltered bay.

Then and there it was that chiefs such as Alfred or Clapa, or families like the Billings or the Harlings, set up their *ham*, or home, their *ton*, or town, as at Clapham and Alfreton, Billingham and Harlington. By names such as these and many others—such as *wick*, meaning a village ; *staple*, a store—we trace their settlements along the shore, up the courses of the rivers, and across the fertile plains. These names are still on our lips and are written on our maps.

WHERE THE JUTES, SAXONS, AND ANGLES SETTLED ON OUR SHORES

Our maps also still show us, to some extent, where the different tribes of newcomers settled. Although they belonged to the same great family they bore different names. The Jutes settled in the Isle of Wight and in Kent, which still keeps its name from an old British tribe. Branches of the Saxons, the South, East, and Middle Saxons, made their homes in Sussex, Essex, Middlesex. There was also Wessex of the West Saxons. In course of time the Angles took up their abode in East Anglia, the country of the North and South folk—Norfolk and Suffolk ; and in Lincolnshire. It was the Angles who in the end gave their name to the whole country, which became Angleland, or England.

The settlement fighting went on for a long time, but gradually the families began to feel at home in their *hams* and their allotments, for which they really cast " lots."

In the commons of today, which are so glorious with golden furze and old whitethorn trees, we can tread, as they did, the piece of land left open and *common* to those settled near it. They had common rights, as here and there people have now, to gather wood and bracken, and let their animals roam about.

The first-comers in this greatest of all invasions that made England England were Jutes, under Hengist and Horsa, who settled by invitation in the Island of Thanet to drive away the dreaded Picts, now pressing into the country from the North. But soon the fearless sea-rovers from the country we call Jutland, or the peninsular part of Denmark, seeing that the land they had been engaged to defend was a goodly land, that it was a land rich of soil and warmed by the sun, determined to conquer it for themselves, and with that began the settlement here of the English race.

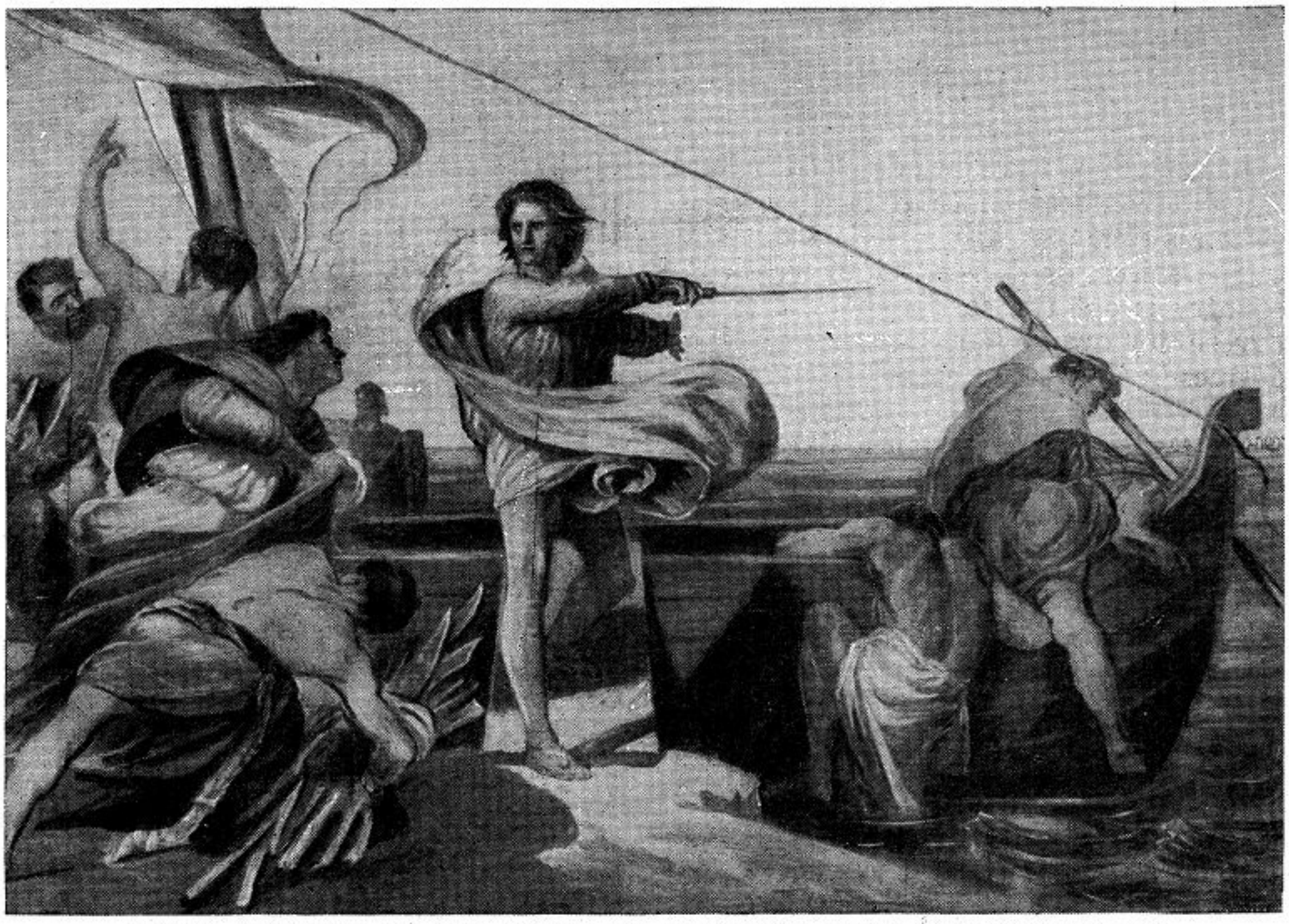
EGBERT, THE FIRST OF THE MANY RULERS OF ENGLAND

The hosts of Horsa suddenly left their camp on Thanet—then a real island—struck westward into the valley of the Medway, and there, at the ford which allowed the river to be crossed about midway between what are now Canterbury and Chatham, at Aylesford, took place the first battle to be fought by Englishmen on English soil.

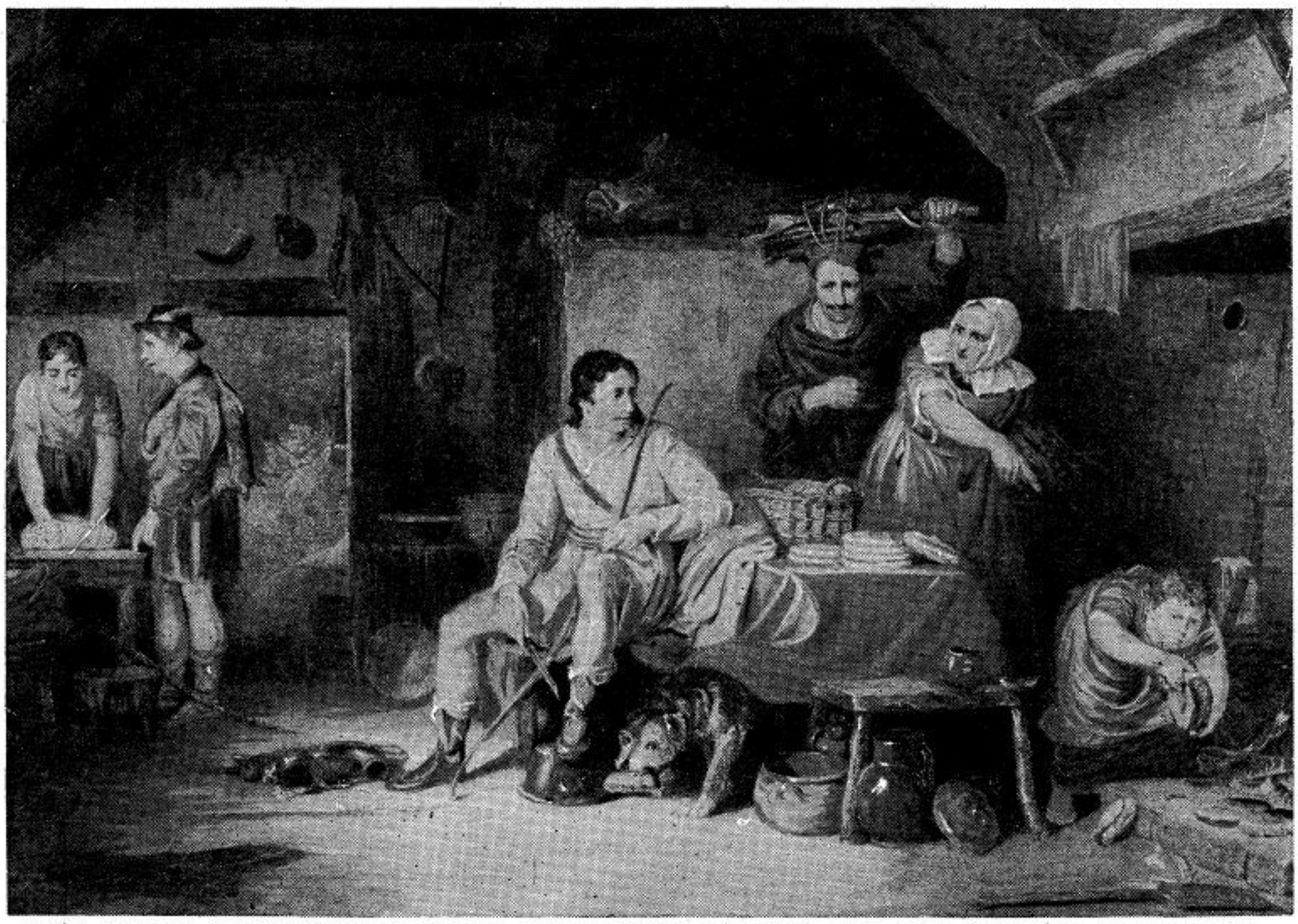
Though Horsa himself was slain by the Britons who defended the ford, the invaders won the victory, and a step that never would be retraced was taken by the Jutes in their choice of a new home. The true founding of England took place in mid-Kent at the battle of the ford over the Medway.

For some years the country was divided up into several kingdoms, such as Kent,

ALFRED AT WAR AND ALFRED AT REST



ALFRED APPEALING TO THE PEOPLE TO DRIVE THE DANES OUT OF ENGLAND



THE ANGRY HOUSEWIFE SCOLDING THE UNKNOWN KING FOR LETTING HER CAKES BURN

In the midst of the misery of the English people caused by the fighting Danes there arose one of the noblest of our kings, Alfred. But he had a troubled life, and once hid in a cottage. The housewife let him mend his bow by the fire if he would promise to see that her cakes did not burn; but Alfred was too deep in thought to notice the cakes, and was scolded severely by the housewife when she came back to find them like cinders.

Wessex, Mercia, Northumbria. Often they were bitter enemies; but at last, at the beginning of the ninth century, they all acknowledged one overlord, Egbert. He has been called the first King of England. There have been more than fifty rulers since his time.

The shires, or divisions into which the country is cut up, so that each part can govern its own affairs, were formed by degrees in those old times. It is interesting to remember here that the word *shire* comes from a word like *shears*, meaning cut off. Sometimes the shire was one of the old kingdoms, or a part of one; sometimes it was named after a town of importance, such as Derby-shire.

Our family treasures, as we can see in the Anglo-Saxon Room at the British Museum, are dug up from all parts of these shires. In Lincolnshire a railway cutting goes right through a large cemetery. On the breezy downs of the Isle of Wight many warriors were laid to rest, with their weapons and ornaments beside them. Numbers come from Kent.

THE MISSIONARIES WHO CAME TO PREACH TO THE WILD NORTH

How beautiful those swords and knives must have looked when they were new. It was the mother who gave the weapons to the lad when the time came for him to follow his father to battle or the chase, bidding him keep them and to treasure them till the time came when death should take them from him.

The names of the children of those days, such as Edith, Edgar, Edwin, and Edward, have come down to us.

Sculptured stone crosses remind us that missionaries came over from Ireland to preach to the wild North; others came from Rome to the South to persuade men to give up the gods of their forefathers and become Christians. There was a long, fierce struggle before they succeeded. Woden, the god of war; Thor, the god of thunder; Freya, the goddess of peace and plenty, still come to mind as we speak of Wednes-day, Thurs-day, Fri-day.

A fine cross was put up some years ago near Minster, in the Isle of Thanet, to mark the spot where Augustine, the Roman missionary, landed toward the end of the sixth century. Headed by a painted cross and waving banners, he and his clergy set out for Canterbury from here, chanting hymns and prayers as they went along.

The pillow-stones which were found under the heads of nuns make one think of the numbers of women, as well as men, who were often thankful to retire in those rough times to the quiet of a religious house, to read and write, to think and pray.

EDWIN, THE GREAT KING WHO FOUNDED EDINBURGH, OR EDWIN'S TOWN

Edwin was one of the greatest of the first Christian kings. It was he who founded Edinburgh—Edwin's burgh, or town. He needed a strong fort to protect the fertile lands to the south of the Forth—our Lothians of today—and to hold the roads from the North. The castle rock gave the needed protection to the town which grew up round its base.

About this time arose Caedmon, the first English poet, from a religious house or monastery on the cliffs above Whitby in Yorkshire, to which he had retired when his great gift of song was discovered.

On the same coast, a little farther north, where now is heard the great noise of iron shipbuilding, there lived and died the great scholar and writer Bede, often called the Venerable Bede. He spent his whole life learning and teaching, and translating and writing books for the pupils who gathered round him. His chief work, perhaps, is the history of the Church of the country, which has gained him the title of the first English historian.

THE BOOK OF THE OLD SCHOLAR BEDE AND THE STORY IT TELLS

There is still a copy of Bede's book to be seen, written in Latin, in one of the most precious cases in the British Museum. Bede's book is open at the page which tells the old story of how Augustine came to be sent to preach to the English. The handsome, fair, blue-eyed boys, being sold for slaves in the market at Rome, attracted the pity of a young monk, afterwards Pope Gregory. He made a joke on their name when it was told him. "Not Angles, but Angels," he said, "they are so beautiful." As soon as he had the power he sent Augustine and a band of missionaries to carry Christianity into the boys' country.

Many another story does Bede tell. He sent all over the country to gather all the information he could, and as one

reads the account of his gentle ways and his hard work to the very end of his life, one feels a great love for the saintly man.

But once more dark and bitter times fell upon the land, and learning and peace were again destroyed. Hardly had Egbert of Wessex made himself overlord of the country from the Forth to the Channel when more sea-rovers poured eagerly into it.

HOW THE FURIOUS DANES CAME DOWN UPON ENGLAND

They were even more fierce and wild than the English tribes had been three centuries before. They, too, came in fine boats, often blazing with colour, sometimes black as night, with high, carved figureheads and the dreaded Raven banner at the mast. They came across the North Sea, like the Jutes, and Saxons, and Angles. Their homes were in the lowlands of Denmark, in Sweden, and along the jagged coast of Norway. All were of the same stock—Danes ; North, or Norse, men ; Vikings, or men of the creeks. "From the fury of the Northmen, good Lord, deliver us!" was the prayer of the Christians they attacked.

All the Northmen particularly hated and despised the religion which had taken the place of the old one to which they fiercely clung. So over the stricken land flames went up from the monasteries and churches, and those who had sought refuge in them were slain. Think of it! Caedmon's haven of rest at Whitby was not spared, nor Bede's at Jarrow, nor the beautiful abbey on the little island of Lindisfarne, where Columba and Aidan, missionaries from the West, had lived. London was burned, and the whole country harried and plundered.

THE STORY OF THE TROUBLED LIFE OF ALFRED THE GREAT

In the midst of all this, toward the end of the ninth century, there uprose one of the noblest of the English kings, Alfred the Great, the Truth-teller, the Wise. His titles and the very stories about his good nature, bravery, and industry which have been handed down to our times show how beloved he was by his subjects—a thousand years ago.

When he first became king the Danes were quiet for a while, and he made good use of this peaceful time to build ships to prevent the sea-rovers landing. This was the beginning of our Navy. He also did his best to get the country into order, and soldiers trained to fight.

For a time after the return of the Danes things went against Alfred, and he had to hide. He hid one day in a swineherd's cottage where the swineherd's wife was making cakes. Not knowing the king, she let him sit by the hearth mending his bow and arrow if he would promise to see that the cakes did not burn while she was out. By the blazing red fire on the hearth sat the young king, deep in anxious thought—so deep in thought that he did not notice the strong smell of the cakes as they burned to cinders. It was rather provoking for the housewife, and, not knowing to whom she was speaking, she scolded the king severely for letting her cakes burn.

Another story from this time is of his venturing alone, disguised as a singer, into the Danish camp night after night, to find out their plans. Soon after this he won a great victory, and the treaty or arrangement which followed gave peace for many years. In his wisdom he saw that the country would be ruined unless fighting could be stopped ; and arranged to share the country with the Danes.

HOW ALFRED RULED WITH THE HELP OF THE ASSEMBLY OF WISE MEN

The part which the Danes had was called the Danelaw, because there the people were under Danish, not Saxon, laws. Part of the boundary was the Roman road which ran through London to Chester, called Watling Street.

It was not long before Alfred made his half kingdom stronger than the whole had been before his time. He improved his army and built up forts. Then he turned his mind to making good laws with the advice of the assembly of wise men who helped him to rule the country, somewhat in the way that our Parliament helps our sovereigns to rule now. Next he did all he could to teach his people. Since the Danes had destroyed the monasteries there was great ignorance everywhere, for the monasteries had been really schools in which people learned to read and write English and Latin.

So Alfred called together learned men from other countries—they all understood Latin—and they wrote and translated and taught as hard as they could. Alfred himself worked with them. He won a

beautiful book as a prize for learning to read quickly, and he continued to study all his life. Some think it was he who started the first history of England in English, called the Anglo-Saxon Chronicle. There is a copy of it in the British Museum. King Alfred had all the information collected that could be found about older times than his, and then added the story of his reign.

ENGLAND AFTER ALFRED'S DEATH, AND THE SPREAD OF CHRISTIANITY

After his death more was added to this, giving the history of the years as they passed for nearly three centuries. Alfred's work was carried on by his son and a very brave daughter and three grandsons, and for a time it seemed as if the Danes were going to settle down as part of the English nation without further trouble. We can see where they settled by the place-names on our map. Where the English said *tun* or *ton* for town, the Danes said *by*, and so we get Whitby, Derby, and Appleby. Many other parts of names are Danish too, such as *toft*, meaning an enclosure, as in Lowestoft; *scar*, a cliff, as in Scarborough. The long Danish swords in the British Museum remind us of the way in which they swung them round in battle; and the combs recall the flowing hair for which they were so famous.

THE PATIENT WORK OF THE MONKS AND THE MISSIONARIES

In a corner of the Anglo-Saxon Room at the British Museum are some relics which take us across the Irish Channel, to the land of those missionaries we saw preaching in the North of England. As we have seen, when Christianity was preached to the Britons in the time of the Romans the new faith spread to Ireland, and flourished there exceedingly when the heathen Angles and Saxons had stamped it out in Britain. Churches and monasteries were built everywhere, and many people crowded into the only refuges there were in those rough times.

The country was divided into separate kingdoms, as it was in England before Egbert. Fierce fighting went on among them for many a long day. What a contrast there is between this state of things and the peace of the monasteries in which were gathered learned men from all parts! The fame of the beautifully painted manuscripts from these monasteries spread abroad, and other arts that filled up the long days were working in metal and ivory and stone.

The missionaries who poured over the narrow straits near the Giant's Causeway, as the wild tribes of the Scots had done before them, found as beautiful a country as the one they had left in the Western Highlands, but it was wild and waste land they had often to pass over in Northumbria.

Roman Britain stretched as far north as Agricola's forts between the firths of the Forth and Clyde, and later the kingdom of Northumbria, under Edwin, the founder of Edinburgh, also reached as far. The tribes that for long had fought together north of this were united at last under a king called Kenneth, in the first part of the tenth century.

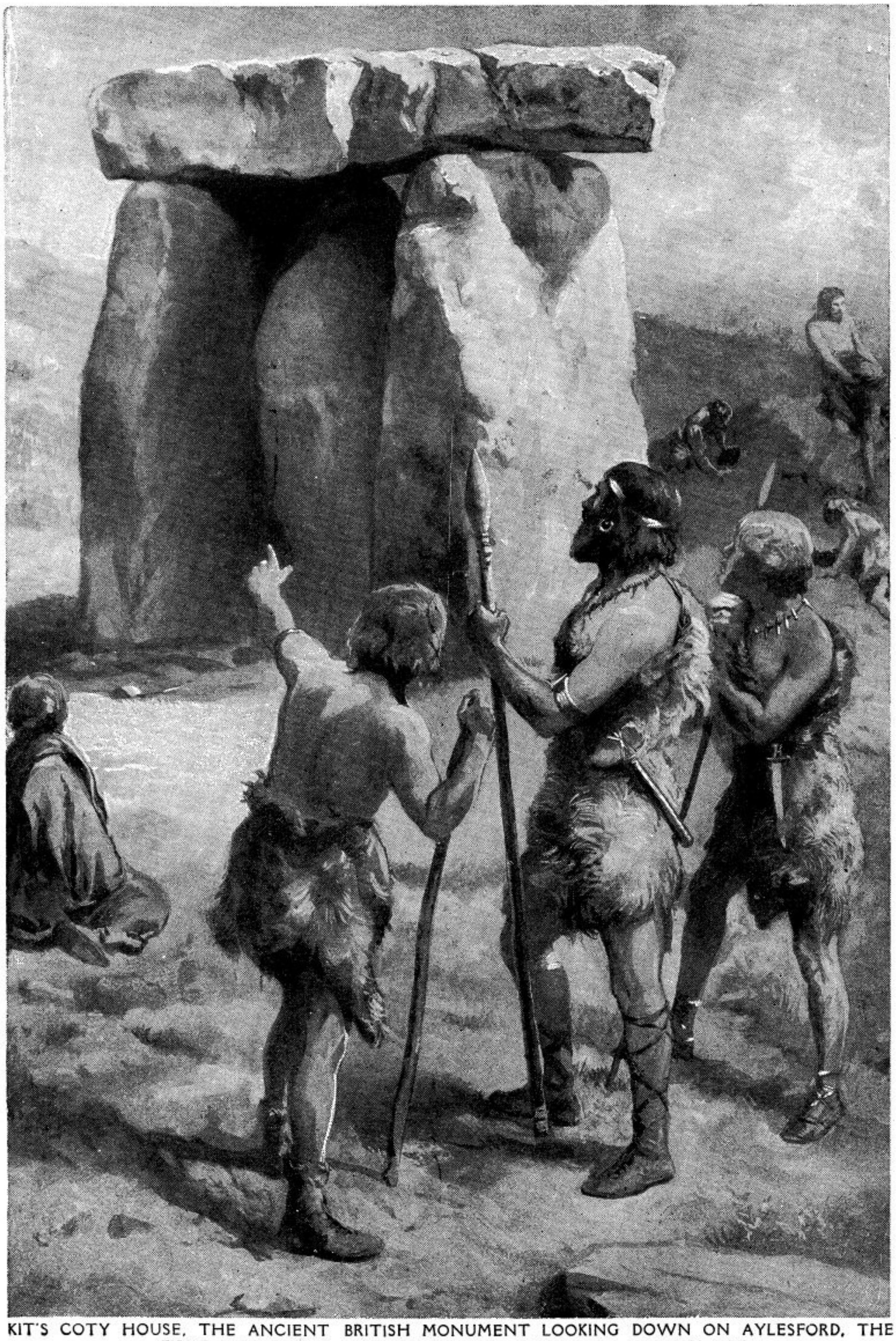
Scotland, too, suffered much from the Northmen, who poured out of their creeks, called fiords, to the creeks or firths of Scotland. Right round the coast they went, taking the Shetlands, the Orkneys, and Hebrides, the rocky head of Scotland north of Glenmore, on their way down to the Isle of Man. Many traces of their rule remain to this day.

EDGAR THE PEACEFUL KING, ETHELRED THE UNREADY, AND CANUTE THE DANE

The name of Edgar stands out in the same century as Kenneth's. He was called the Peaceful King, which shows that he lived on good terms with his neighbours, even if the story is not true about six kings rowing him on the River Dee.

In the time of his son, Ethelred, called the Unready because he would take no man's counsel (or *rede*), fresh bands of Danes appeared in England. Ethelred, at his wits' end, paid them money to go away, but they soon came back for more. Matters became worse and worse, so Ethelred fled away over the Channel to Normandy to his wife's relations. Then Canute, the Danish king who also ruled Norway, added England to his empire.

Canute was a good king in the end, and the country settled down for a time in peace. It was he who gave up to the Scottish king the land between the Forth and the Cheviots. For many centuries these hills remained the border between the two countries, with a wide road on the east by Berwick-on-Tweed, and a narrow one on the west by the marshy ground near Carlisle. Along these roads the east and west railway routes from England to the north pass today.



KIT'S COTY HOUSE, THE ANCIENT BRITISH MONUMENT LOOKING DOWN ON AYLESFORD, THE FIRST BATTLEFIELD OF THE ENGLISH PEOPLE ON ENGLISH SOIL

ENGLAND AND HER OLD, OLD STORY—A PICTURE-MAP OF ENGLISH HISTORY

EDINBURGH
GLASGOW
SCOTLAND
NORTH CHANNEL
BELFAST
ISLE OF MAN
I R I S H S E A
ANGLESEY
NEWCASTLE
DARLINGTON
STOCKTON
HULL
N O R T H S E A
Route of the Spanish Armada

Here in 1513 was fought the Battle of Flodden Field

Bede lived at Jarrow Monastery, where he wrote his history and translated St. John. He died there in 735

Caedmon, first notable Anglo-Saxon writer, was a monk at Whitby. He died 680

Here Hadrian built a wall across Britain in 121

Here the coal forests flourished millions of years ago

Mary Queen of Scots landed at Workington in 1568 when she fled from Scotland

In the Middle Ages many famous abbeys grew up in this part of England

George Stephenson's Rocket ran from Stockton to Darlington, on the world's first railway, in 1825

In the 11th. century Viking rovers captured the Isle of Man, which became Norwegian territory

James Hargreaves made the first spinning jenny at Blackburn, 1764

Here Cromwell won his great victory of Marston Moor, 1644

On the Yorkshire moors in the Middle Ages were refuges for travellers pursued by wolves

The remnants of the Spanish Armada fled northward pursued by Drake, 1588

The Roman Suetonius defeated the Britons and captured the Druid headquarters in Anglesey, 62

Here in 973 Edgar is said to have been rowed on the Dee by eight tributary kings

Samuel Crompton invented at Firwood, in 1779, the spinning mule which revolutionised the textile industry

At Dore, in 829, the Northern Kings submitted to Egbert, who thus became first King of all England

Here millions of years ago lived the pterodactyl, an enormous flying reptile

Nelson born at Burnham Thorpe, 1758

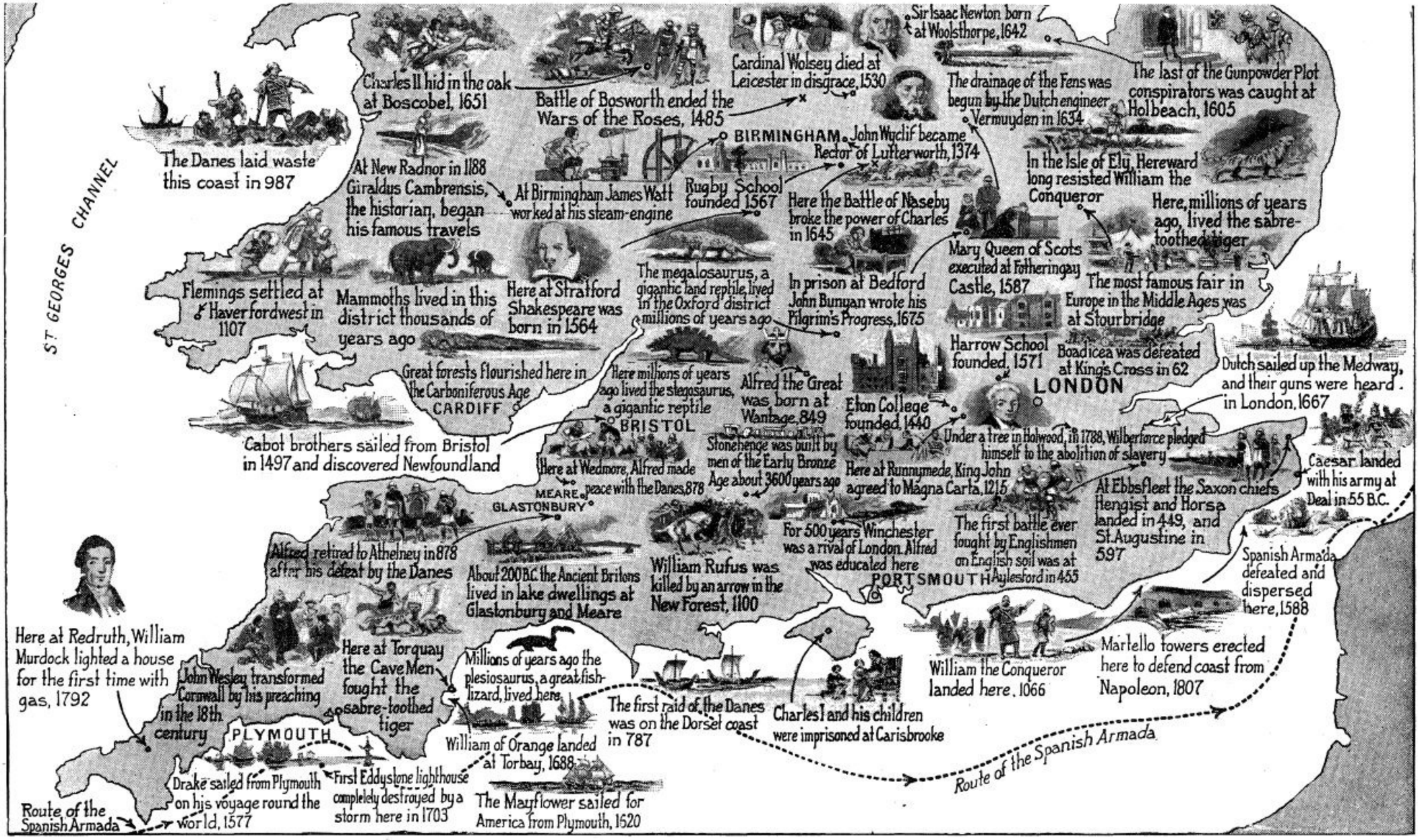
The last raid of the Vikings under Magnus, King of Norway, was made here in 1098

At Chester in Roman times was a very important military station

During the Great Plague the stricken village of Eyam shut itself off to save the country round

The first spinning frame was made at Nottingham in 1768 by Richard Arkwright

Charles Stuart raised his standard at Nottingham, 1642, beginning the Civil War


ST GEORGES CHANNEL
The Danes laid waste this coast in 987
Charles II hid in the oak at Boscobel, 1651
Battle of Bosworth ended the Wars of the Roses, 1485
Cardinal Wolsey died at Leicester in disgrace, 1530
Sir Isaac Newton born at Woolsthorpe, 1642
The drainage of the Fens was begun by the Dutch engineer Vermuyden in 1634
The last of the Gunpowder Plot conspirators was caught at Holbeach, 1605
BIRMINGHAM
John Wyclif became Rector of Lutterworth, 1374
At New Radnor in 1188 Giraldus Cambrensis, the historian, began his famous travels
At Birmingham James Watt worked at his steam-engine
Rugby School founded 1567
Here the Battle of Naseby broke the power of Charles in 1645
In the Isle of Ely Hereward long resisted William the Conqueror
Here, millions of years ago, lived the sabre-toothed tiger
Flemings settled at Haverfordwest in 1107
Mammoths lived in this district thousands of years ago
Here at Stratford Shakespeare was born in 1564
The megalosaurus, a gigantic land reptile, lived in the Oxford district millions of years ago
In prison at Bedford John Bunyan wrote his Pilgrim's Progress, 1675
Mary Queen of Scots executed at Fotheringay Castle, 1587
The most famous fair in Europe in the Middle Ages was at Stourbridge
Harrow School founded, 1571
Boadicea was defeated at King's Cross in 62
LONDON
Dutch sailed up the Medway, and their guns were heard in London, 1667
Great forests flourished here in the Carboniferous Age
CARDIFF
Here millions of years ago lived the stegosaurus, a gigantic reptile
BRISTOL
Alfred the Great was born at Wantage, 849
Eton College founded, 1440
Under a tree in Holwood, in 1788, Wilberforce pledged himself to the abolition of slavery
Caesar landed with his army at Deal in 55 B.C.
Cabot brothers sailed from Bristol in 1497 and discovered Newfoundland
Here at Wedmore, Alfred made peace with the Danes, 878
MEARE
GLASTONBURY
Stonehenge was built by men of the Early Bronze Age about 3600 years ago
Here at Runnymede, King John agreed to Magna Carta, 1215
At Ebbsfleet the Saxon chiefs Hengist and Horsa landed in 449, and St. Augustine in 597
Alfred retired to Athelney in 878 after his defeat by the Danes
About 200 B.C. the Ancient Britons lived in lake dwellings at Glastonbury and Meare
William Rufus was killed by an arrow in the New Forest, 1100
For 500 years Winchester was a rival of London. Alfred was educated here
The first battle ever fought by Englishmen on English soil was at Aylesford in 455
PORTSMOUTH
Spanish Armada defeated and dispersed here, 1588
Here at Redruth, William Murdock lighted a house for the first time with gas, 1792
John Wesley transformed Cornwall by his preaching in the 18th century
Here at Torquay the Cave Men fought the sabre-toothed tiger
Millions of years ago the plesiosaurus, a great fish-lizard, lived here
PLYMOUTH
William of Orange landed at Torbay, 1688
The first raid of the Danes was on the Dorset coast in 787
Charles I and his children were imprisoned at Carisbrooke
William the Conqueror landed here, 1066
Martello towers erected here to defend coast from Napoleon, 1807
Route of the Spanish Armada
Drake sailed from Plymouth on his voyage round the world, 1577
First Eddystone lighthouse completely destroyed by a storm here in 1703
The Mayflower sailed for America from Plymouth, 1620
Route of the Spanish Armada

IN THIS MAP OUR ARTIST HAS PICTURED, IN THE PLACES WHERE THEY HAPPENED, SOME OF THE MOST IMPORTANT EVENTS IN ENGLISH HISTORY

SCOTLAND & HER OLD, OLD STORY—A PICTURE-MAP OF SCOTTISH HISTORY

Route along which the ships of the defeated Spanish Armada fled in 1588

The Hebrides were Norwegian till 1264, when they were annexed to Scotland

Here, at Callernish, early men worshipped, in a circular temple of upright stones, like Stonehenge

CALLERNISH

LEWIS

HEBRIDES

During the long Napoleonic Wars, the island of Skye sent 10,000 men to fight for Britain

SKYE

In this district glaciers formerly covered large areas

Even so late as 1790 there was not a cart in the whole of Caithness and life was very primitive

Here at Dornoch in 1722 the last witch burned in Scotland, suffered

DORNOCH

All this wild Pictish area was Christianised by Columba and his missionaries in the middle of the sixth century

FORT AUGUSTUS

Fort Augustus and Fort William were built in the 18th century to restrain the Jacobite clans

FORT WILLIAM

Caledonian Canal was opened in 1822

CULLODEN

Battle of Culloden was fought here in 1746

Here at Harlaw in 1411 Donald, Lord of the Isles, was totally defeated and South Scotland saved from Highland conquest

HARLAW

Here at the foot of the Grampians, Agricola vanquished the Caledonian chief Galgacus in 84

ABERDEEN

LUMPHANAN

Here at Lumphanan in 1057 Macbeth was defeated and slain

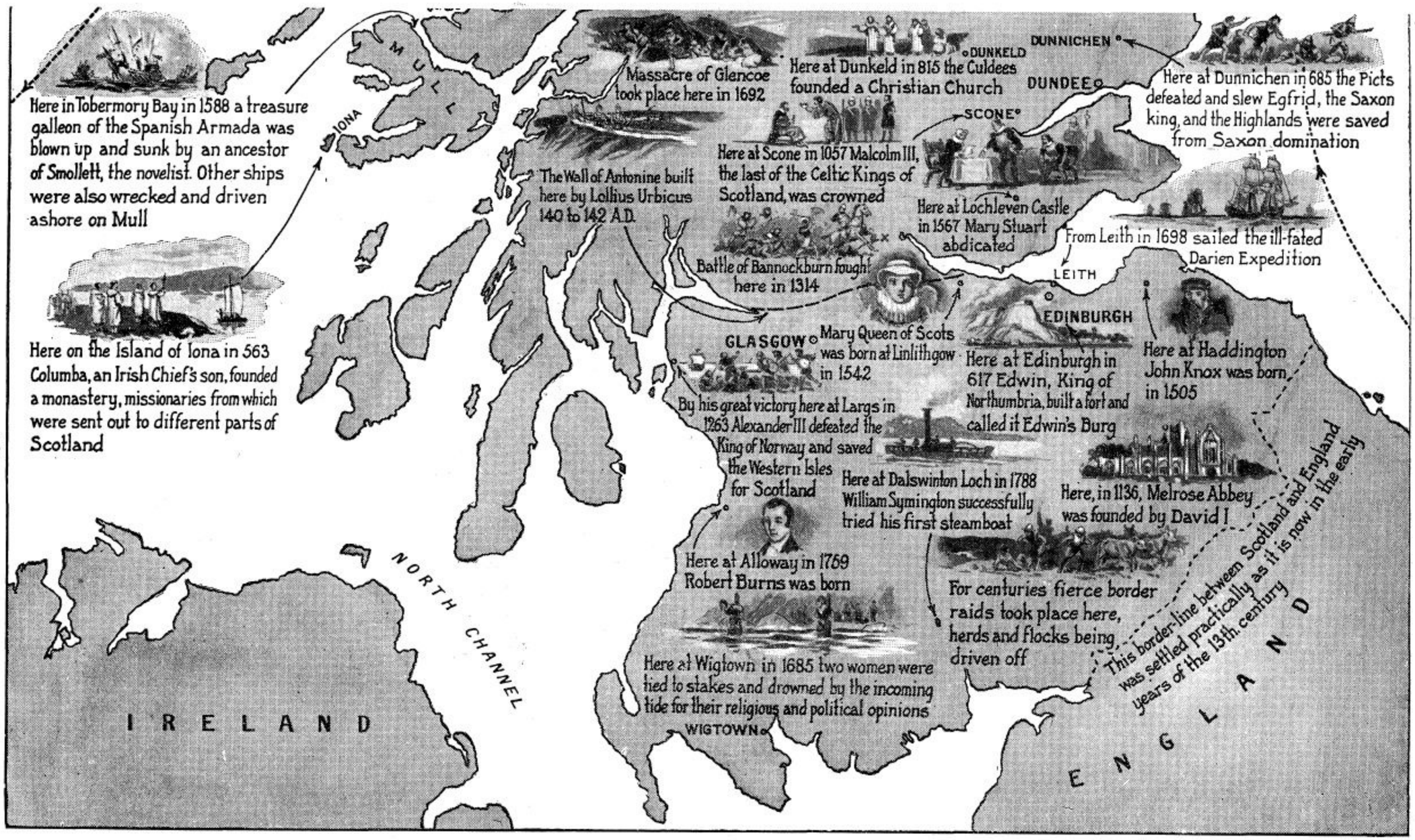
In 1467 the Orkneys and Shetlands ceased to be Norwegian, and became Scottish

SHETLAND ISLANDS

Here on Fair Island in 1588 a flagship of the Spanish Armada was driven ashore and wrecked

ORKNEY ISLANDS

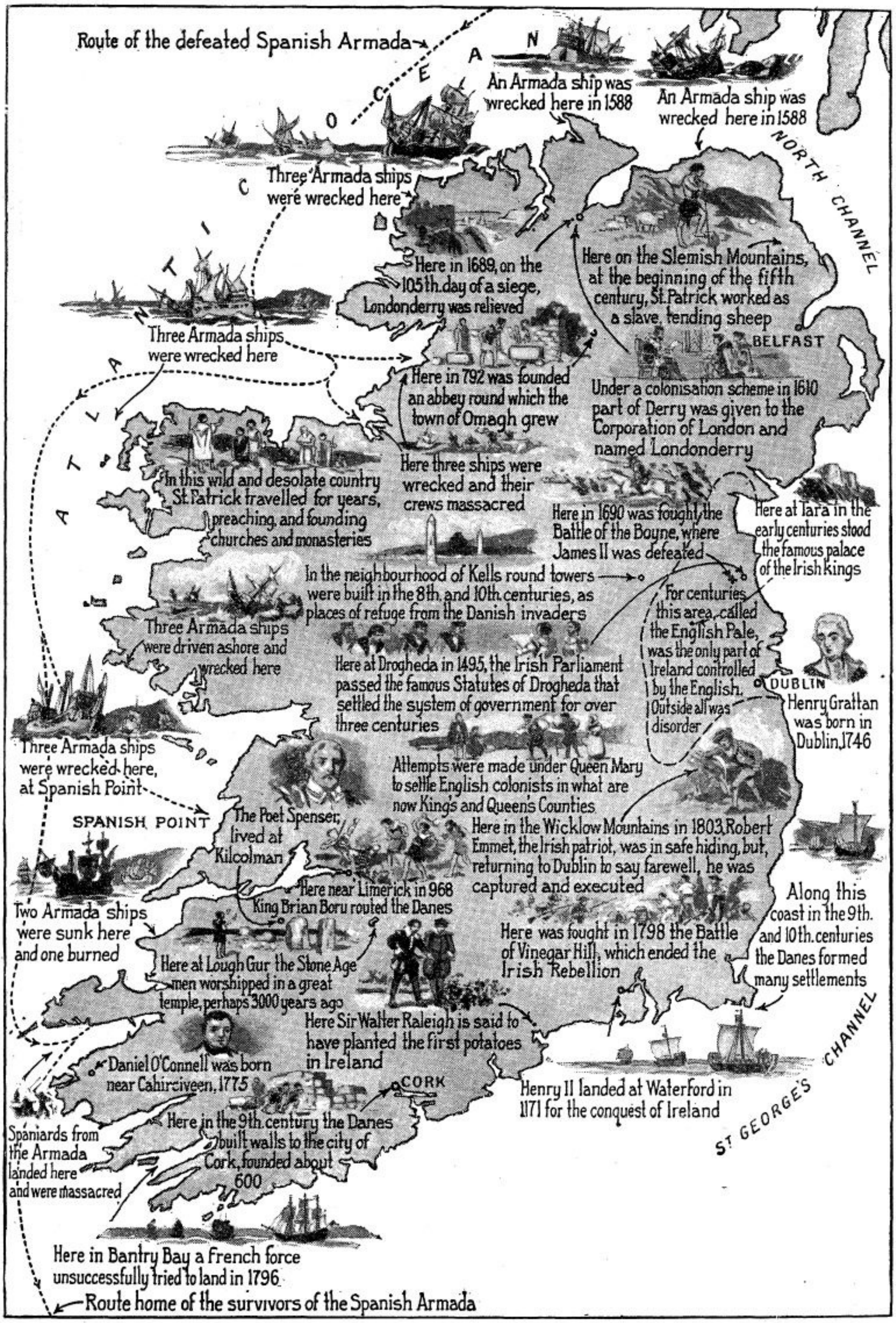
Route along which the ships of the defeated Spanish Armada fled in 1588


Here in Tobermory Bay in 1588 a treasure galleon of the Spanish Armada was blown up and sunk by an ancestor of Smollett, the novelist. Other ships were also wrecked and driven ashore on Mull
MULL
IONA
Here on the Island of Iona in 563 Columba, an Irish Chief's son, founded a monastery, missionaries from which were sent out to different parts of Scotland
Massacre of Glencoe took place here in 1692
The Wall of Antonine built here by Lollius Urbicus 140 to 142 A.D.
Here at Dunkeld in 815 the Culdees founded a Christian Church
DUNKELD
DUNNICHEN
DUNDEE
Here at Dunnichen in 685 the Picts defeated and slew Egfrid, the Saxon king, and the Highlands were saved from Saxon domination
SCONE
Here at Scone in 1057 Malcolm III, the last of the Celtic Kings of Scotland, was crowned
Here at Lochleven Castle in 1567 Mary Stuart abdicated
From Leith in 1698 sailed the ill-fated Darien Expedition
Battle of Bannockburn fought here in 1314
LEITH
EDINBURGH
GLASGOW
Mary Queen of Scots was born at Linlithgow in 1542
Here at Edinburgh in 617 Edwin, King of Northumbria, built a fort and called it Edwin's Burg
Here at Haddington John Knox was born in 1505
By his great victory here at Largs in 1263 Alexander III defeated the King of Norway and saved the Western Isles for Scotland
Here at Dalswinton Loch in 1788 William Symington successfully tried his first steamboat
Here, in 1136, Melrose Abbey was founded by David I
Here at Alloway in 1759 Robert Burns was born
For centuries fierce border raids took place here, herds and flocks being driven off
This border-line between Scotland and England was settled practically as it is now in the early years of the 13th century
Here at Wigtown in 1685 two women were tied to stakes and drowned by the incoming tide for their religious and political opinions
WIGTOWN
NORTH CHANNEL
IRELAND
ENGLAND

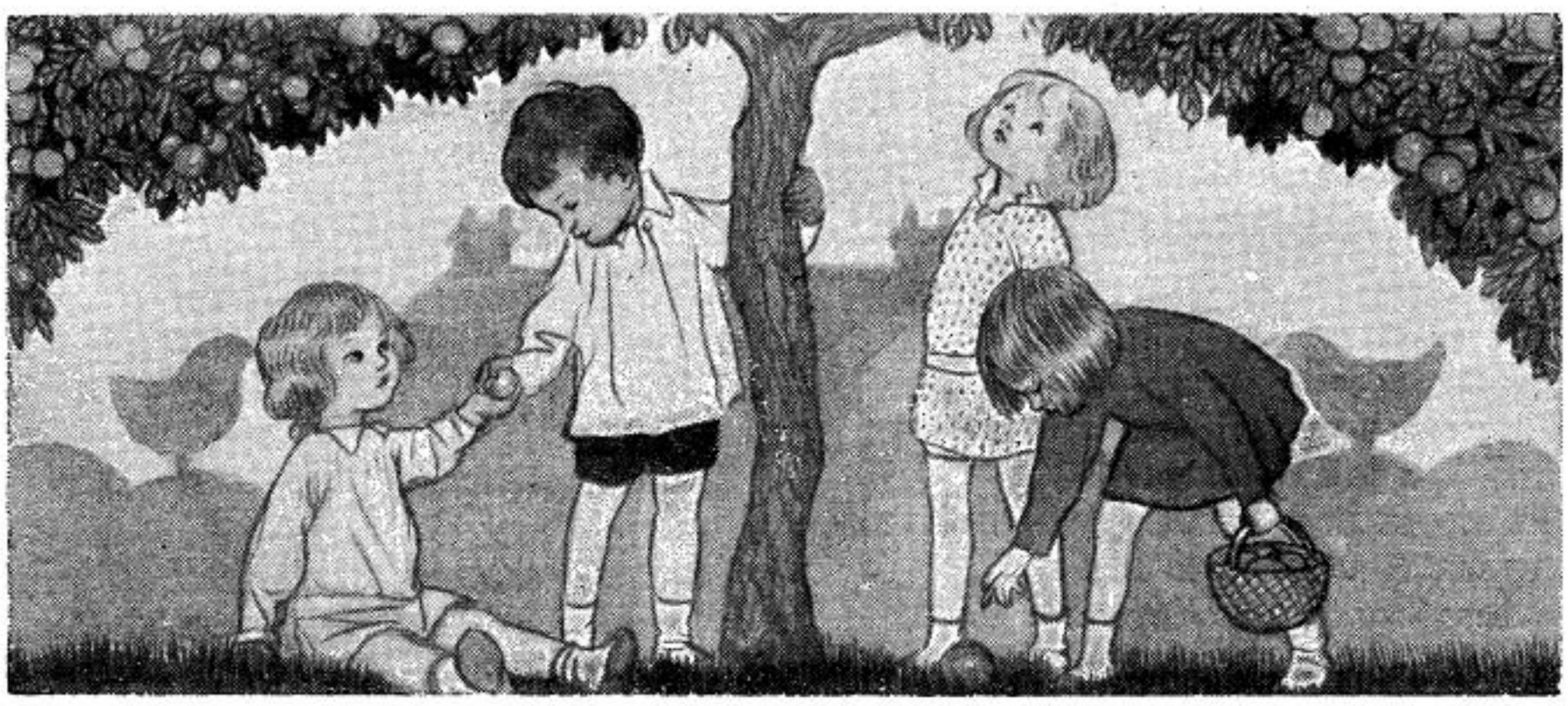
IN THIS MAP OUR ARTIST HAS PICTURED, IN THE PLACES WHERE THEY HAPPENED, SOME OF THE MOST IMPORTANT EVENTS IN SCOTTISH HISTORY

Orkney and Shetland are shown only one-third scale of the main map

PICTURE-MAP OF IRELAND'S HISTORY


Route of the defeated Spanish Armada
An Armada ship was wrecked here in 1588
An Armada ship was wrecked here in 1588
NORTH CHANNEL
Three Armada ships were wrecked here
Here in 1689, on the 105th. day of a siege, Londonderry was relieved
Here on the Slemish Mountains, at the beginning of the fifth century, St. Patrick worked as a slave, tending sheep
BELFAST
Three Armada ships were wrecked here
Here in 792 was founded an abbey round which the town of Omagh grew
Under a colonisation scheme in 1610 part of Derry was given to the Corporation of London and named Londonderry
In this wild and desolate country St. Patrick travelled for years, preaching, and founding churches and monasteries
Here three ships were wrecked and their crews massacred
Here in 1690 was fought the Battle of the Boyne, where James II was defeated
Here at Tara in the early centuries stood the famous palace of the Irish kings
In the neighbourhood of Kells round towers were built in the 8th. and 10th. centuries, as places of refuge from the Danish invaders
Three Armada ships were driven ashore and wrecked here
Here at Drogheda in 1495, the Irish Parliament passed the famous Statutes of Drogheda that settled the system of government for over three centuries
For centuries this area, called the English Pale, was the only part of Ireland controlled by the English. Outside all was disorder
DUBLIN
Henry Grattan was born in Dublin 1746
Three Armada ships were wrecked here, at Spanish Point
SPANISH POINT
Attempts were made under Queen Mary to settle English colonists in what are now King's and Queen's Counties
The Poet Spenser lived at Kilcolman
Here in the Wicklow Mountains in 1803 Robert Emmet, the Irish patriot, was in safe hiding, but, returning to Dublin to say farewell, he was captured and executed
Here near Limerick in 968 King Brian Boru routed the Danes
Two Armada ships were sunk here and one burned
Here was fought in 1798 the Battle of Vinegar Hill, which ended the Irish Rebellion
Along this coast in the 9th. and 10th. centuries the Danes formed many settlements
Here at Lough Gur the Stone Age men worshipped in a great temple, perhaps 3000 years ago
Here Sir Walter Raleigh is said to have planted the first potatoes in Ireland
Daniel O'Connell was born near Cahirciveen, 1775
CORK
CHANNEL
Henry II landed at Waterford in 1171 for the conquest of Ireland
Here in the 9th. century the Danes built walls to the city of Cork, founded about 600
ST GEORGE'S
Spaniards from the Armada landed here and were massacred
Here in Bantry Bay a French force unsuccessfully tried to land in 1796
Route home of the survivors of the Spanish Armada

In this picture-map the chief events in Irish history are shown in the places where they occurred. The birthplaces of famous men, the scenes of social changes, famous battles and sieges, are all shown. One of the most interesting features of the map is the route taken by the defeated Spanish Armada on the way home. By comparing this map with the history maps of England and Scotland the Armada's path round the British Isles may be traced.



PLANTING THE APPLE TREE

William Cullen Bryant, the American poet, was the author of these verses, which, in all likelihood, were suggested to him by his having himself planted an apple tree. The planting of any tree is a favourite subject of the poets, leading the mind in the most natural way to contemplate the continuous growth of the tree possibly for centuries after the hand that planted it lies still. Tree-planters are at work all over the world, however, who never give a thought to the poetic side of their occupation, yet their labours are as suggestive of romance as any we can engage in.

COME, let us plant the apple tree,
Cleave the tough greensward with the spade.
Wide let its hollow bed be made;
There gently lay the roots, and there
Sift the dark mould with kindly care,
And press it o'er them tenderly,
As, round the sleeping infant's feet,
We softly fold the cradle-sheet;
So plant we the apple tree.

WHAT plant we in this apple tree?
Buds, which the breath of summer days
Shall lengthen into leafy sprays;
Boughs, where the thrush with crimson breast
Shall haunt and sing, and hide her nest;
We plant, upon the sunny lea,
A shadow for the noontide hour,
A shelter from the summer shower,
When we plant the apple tree.

WHAT plant we in this apple tree?
Sweets for a hundred flowery springs
To load the May wind's restless wings
When from the orchard-row he pours
Its fragrance through our open doors;
A world of blossoms for the bee,
Flowers for the sick girl's silent room,
For the glad infant sprigs of bloom,
We plant with the apple tree.

WHAT plant we in this apple tree?
Fruits that shall swell in sunny June,
And redden in the August noon,
And drop when gentle airs come by
That fan the blue September sky,
While children come, with cries of glee,
And seek them where the fragrant grass
Betrays their bed to those who pass,
At the foot of the apple tree.

THE fruitage of this apple tree
Winds, and our flag of stripe and star
Shall bear to coasts that lie afar,
Where men shall wonder at the view,
And ask in what fair climes they grew;
And sojourners beyond the sea
Shall think of childhood's careless day,
And long, long hours of summer play
In the shade of the apple tree.

EACH year shall give this apple tree
A broader flush of roseate bloom,
A deeper maze of verdurous gloom,
And loosen, when the frost clouds lower,
The crisp brown leaves in thicker shower.
The years shall come and pass, but we
Shall hear no longer, where we lie,
The summer's songs, the autumn's sigh,
In the boughs of the apple tree.

WHO planted this old apple tree?
The children of that distant day
Thus to some aged man shall say;
And, gazing on its mossy stem,
The grey-haired man shall answer them:
"A poet of the land was he,
Born in the rude but good old times:
'Tis said he made some quaint old rhymes
On planting the apple tree."

TO MY FRIENDS BECOME MINISTERS

Béranger, the celebrated French poet (1780–1857), was, like Robert Burns, a lover of the common people, and, although he greatly admired Napoleon and sang his praises, he preferred the friendship of humble people and their simple ways of life, as we find from this poem, addressed to certain friends of his who had become important officials.

No, no, my friends, my wants are few ;
Elsewhere with your good things make free ;
Courts may be well enough for you,
But spread no royal snare for me.
All that I ask is Love's caress,
Blithe comrades, and a crust of bread ;
Bending my lowly cot to bless,
" Be nothing," the Almighty said.

Splendour would but embarrass me,
Who idly sing from day to day ;
Were Fortune's crumbs my share to be,
" I've never earned them," I should say.
On honest Labour's humble board
More fitly far they would be spread ;
At least my wallet's amply stored !
" Be nothing," the Almighty said.

One day, upwafted in a dream,
From heaven I gazed down on the world ;
There, all in one vast living stream,
Were monarchs, nations, armies swirled.
I heard a shout, 'twas Victory's strain ;
One name from realm to realm was sped—
Ye great, and thus your glories wane !
" Be nothing," the Almighty said.

Nevertheless, all praise to you
Intrepid pilots of the realm,
Who, bidding each his ease adieu,
Haste to the storm-struck vessel's helm ;
" Good luck," I holloa from the shore,
" Right nobly may you speed ahead ! "
Then in the sun I bask once more—
" Be nothing," the Almighty said.

Your graves will be superb, no doubt,
Mine but a nameless mound of grass ;
Crape-covered crowds will see you out,
I in a pauper's hearse shall pass.
Yet to us all doom is but doom,
Your glow is quenched, my glimmer fled ;
The only difference is the tomb !
" Be nothing," the Almighty said.

Then let me be myself once more,
To pomp I make my last salute ;
Behind your grandly gilded door
I've left my hobnails and my flute !
Though Freedom, to us both so sweet,
Your painted halls need never dread ;
I'll pipe her praises in the street—
" Be nothing," the Almighty said.

THE FLAG GOES BY

The writer of this stirring poem, Henry Holcomb Bennett, was an American of the Western States. Men of each free nation can apply these words to their own flag ; but more than all should British people be thrilled by the thought of the long-won and wide-won honour of the British ensign—the first flag of the free that ever floated on the wind.

Hats off !
Along the street there comes
A blare of bugles, a ruffle of drums,
A flash of colour beneath the sky :
Hats off !
The flag is passing by !

Blue and crimson and white it shines
Over the steel-tipped, ordered lines.
Hats off !
The colours before us fly ;
But more than the flag is passing by.

Sea-fights and land-fights, grim and great,
Fought to make and to save the State :
Weary marches and sinking ships ;
Cheers of victory on dying lips ;

Days of plenty and years of peace ;
March of a strong land's swift increase ;
Equal justice, right, and law,
Stately honour and reverend awe.

Sign of a nation, great and strong
To ward her people from foreign wrong ;
Pride and glory and honour—all
Live in the colours to stand or fall.

Hats off !
Along the street there comes
A blare of bugles, a ruffle of drums ;
And loyal hearts are beating high :
Hats off !
The flag is passing by !

ENVOY

An envoy, from the French word envoi, means the verses at the end of a poem in which some general idea of the poem is summed up and emphasised. The envoy is thus the message which the poem has carried to the reader. Here it is a way of saying that the life to which this is the envoy had been of itself a poem. The writer is Charlotte Becker.

Say not, because he did no wondrous deed,
Amassed no worldly gain,
Wrote no great book, revealed no hidden truth,
Perchance he lived in vain.

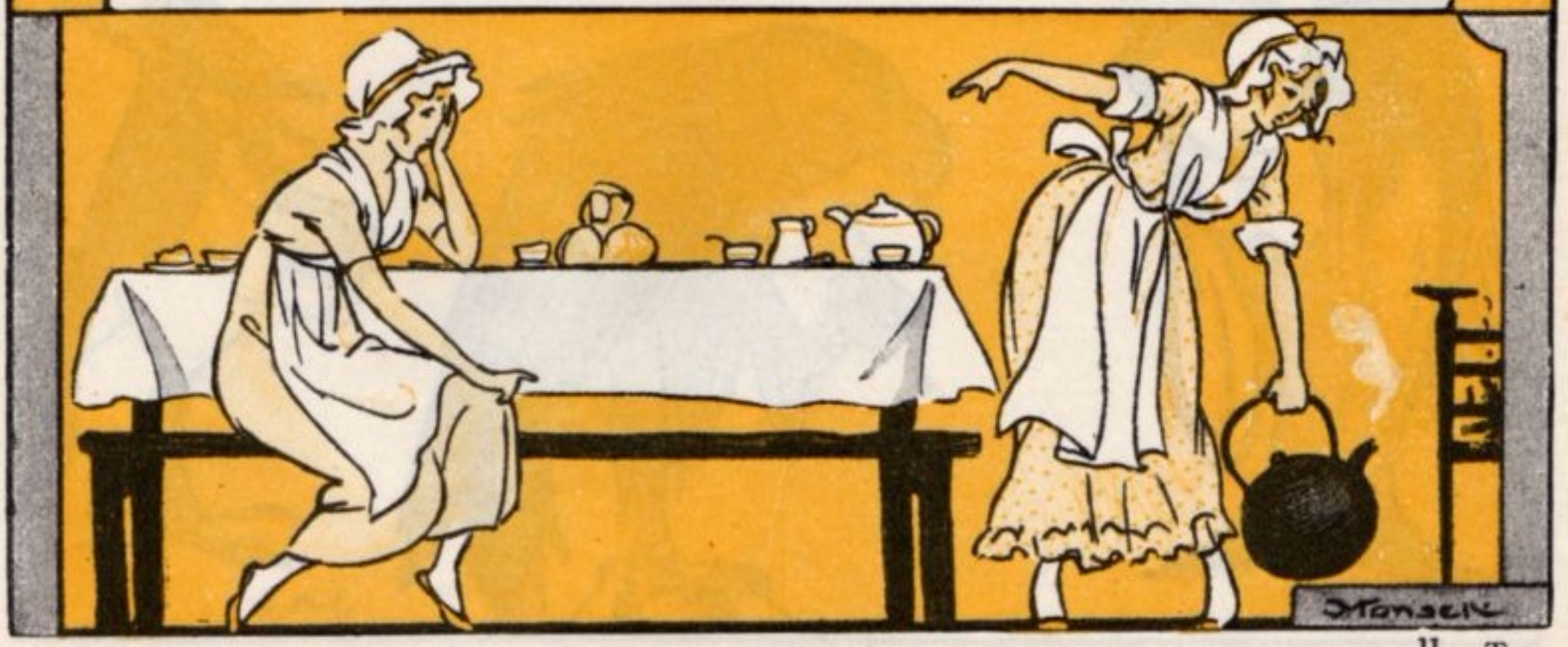
For there was grief within a thousand hearts
The hour he ceased to live ;
He held the love of women and of men :
Life has no more to give !

POLLY, PUT THE KETTLE ON

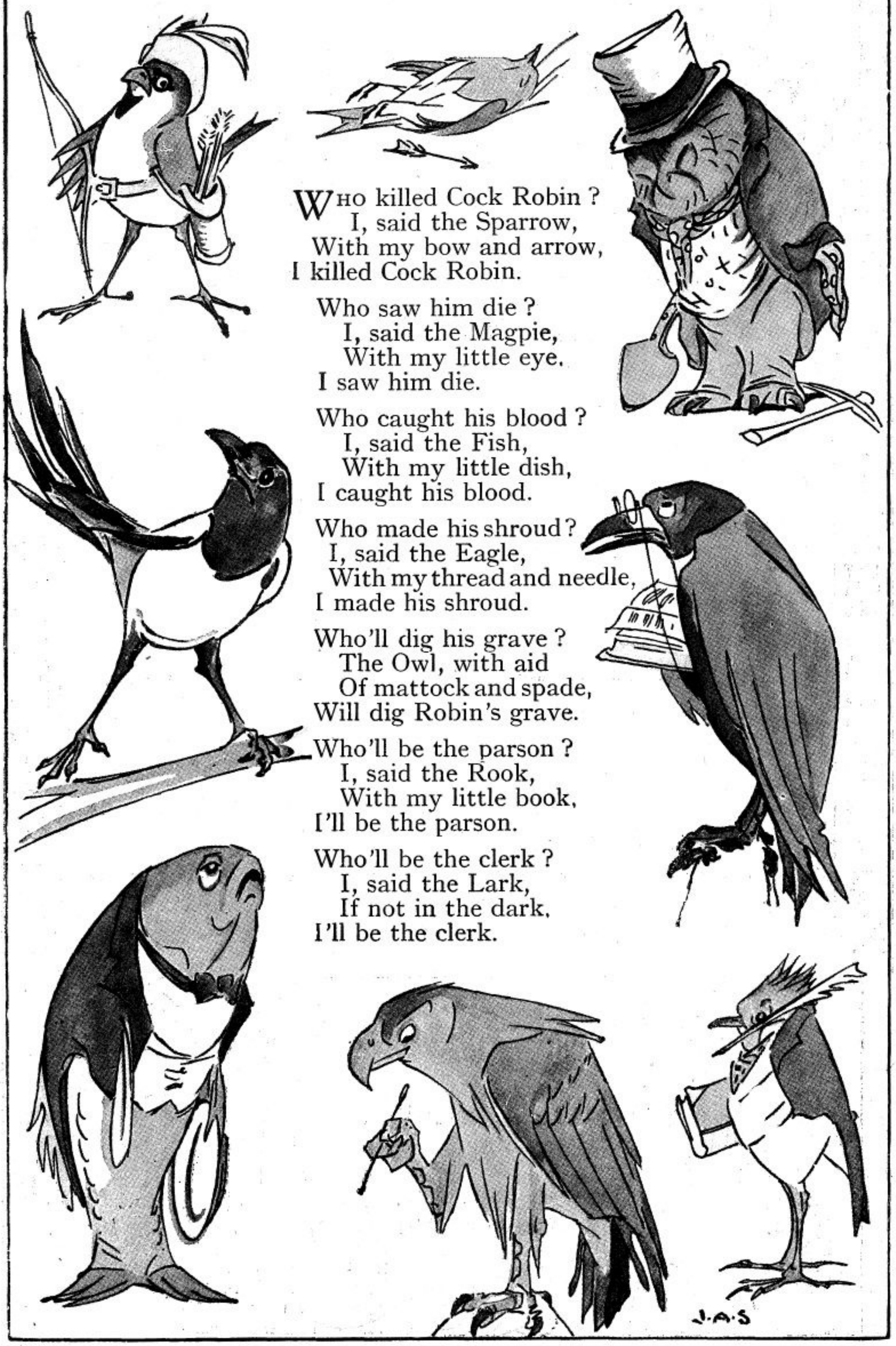
Pol - ly, put the ket - tle on, Pol - ly, put the ket - tle on, Pol - ly, put the

ket - tle on, We'll all have tea. Sukey, take it off a - gain,

Suk - ey, take it off a - gain, Suk-ey, take it off a-gain, They've all gone a - way.



WHO KILLED COCK ROBIN?



Who killed Cock Robin?
I, said the Sparrow,
With my bow and arrow,
I killed Cock Robin.

Who saw him die?
I, said the Magpie,
With my little eye.
I saw him die.

Who caught his blood?
I, said the Fish,
With my little dish,
I caught his blood.

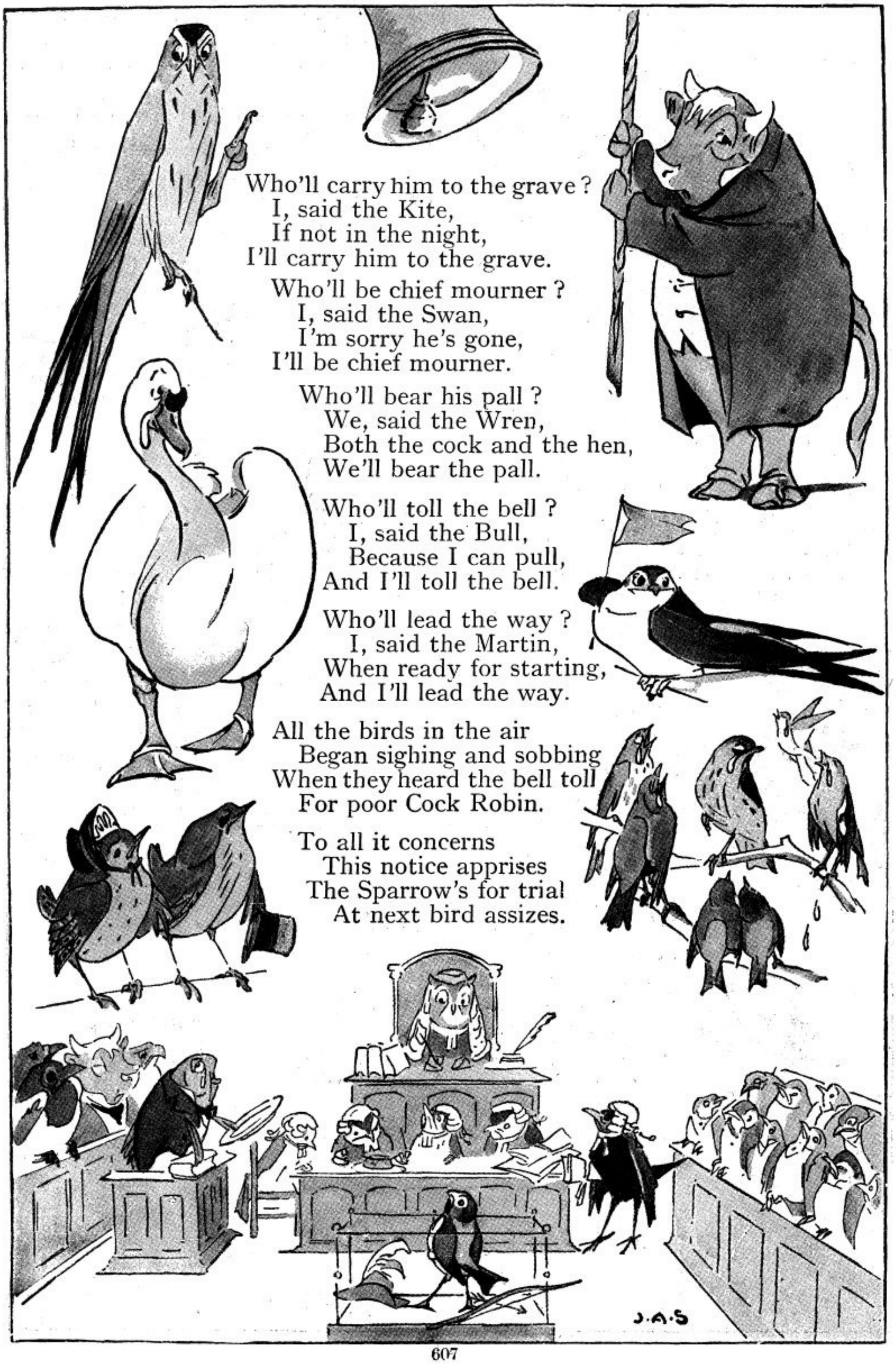
Who made his shroud?
I, said the Eagle,
With my thread and needle,
I made his shroud.

Who'll dig his grave?
The Owl, with aid
Of mattock and spade,
Will dig Robin's grave.

Who'll be the parson?
I, said the Rook,
With my little book,
I'll be the parson.

Who'll be the clerk?
I, said the Lark,
If not in the dark,
I'll be the clerk.

I, SAID THE SPARROW



Who'll carry him to the grave?
I, said the Kite,
If not in the night,
I'll carry him to the grave.

Who'll be chief mourner?
I, said the Swan,
I'm sorry he's gone,
I'll be chief mourner.

Who'll bear his pall?
We, said the Wren,
Both the cock and the hen,
We'll bear the pall.

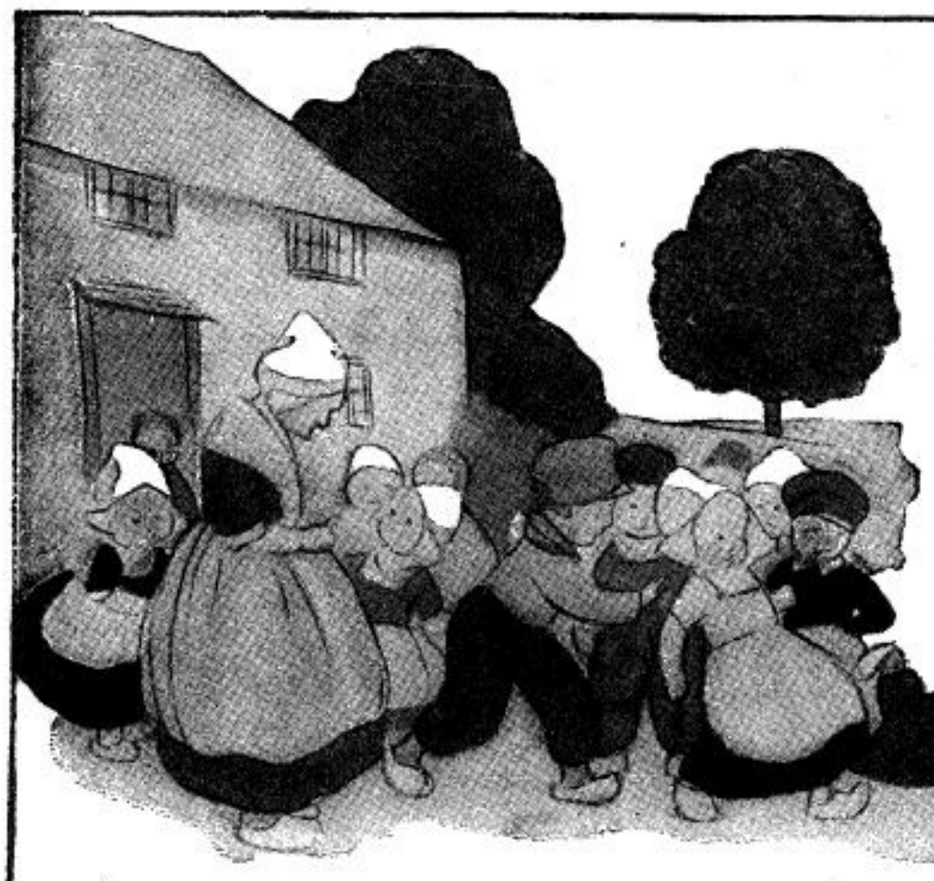
Who'll toll the bell?
I, said the Bull,
Because I can pull,
And I'll toll the bell.

Who'll lead the way?
I, said the Martin,
When ready for starting,
And I'll lead the way.

All the birds in the air
Began sighing and sobbing
When they heard the bell toll
For poor Cock Robin.

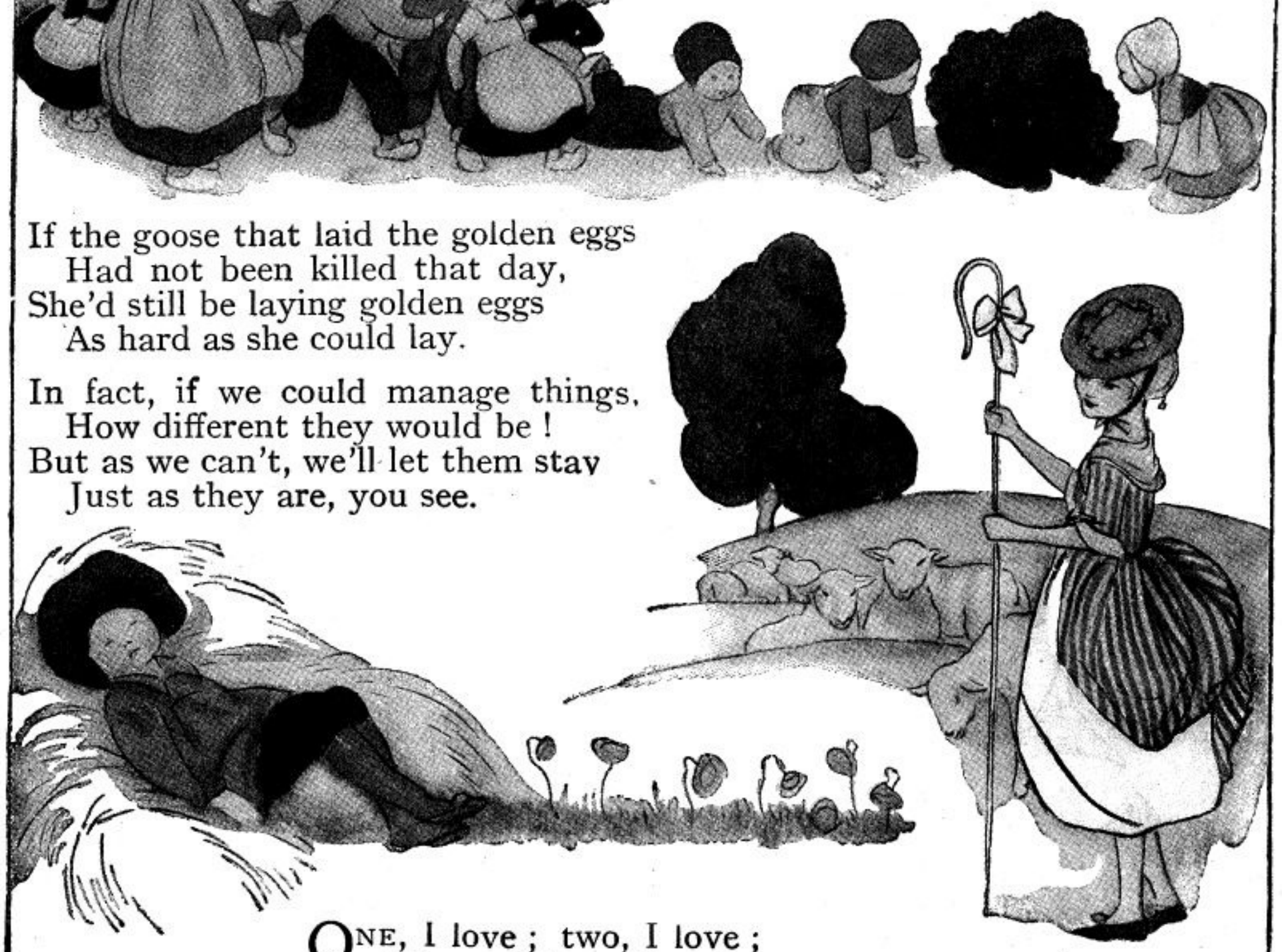
To all it concerns
This notice apprises
The Sparrow's for trial
At next bird assizes.

J.A.S



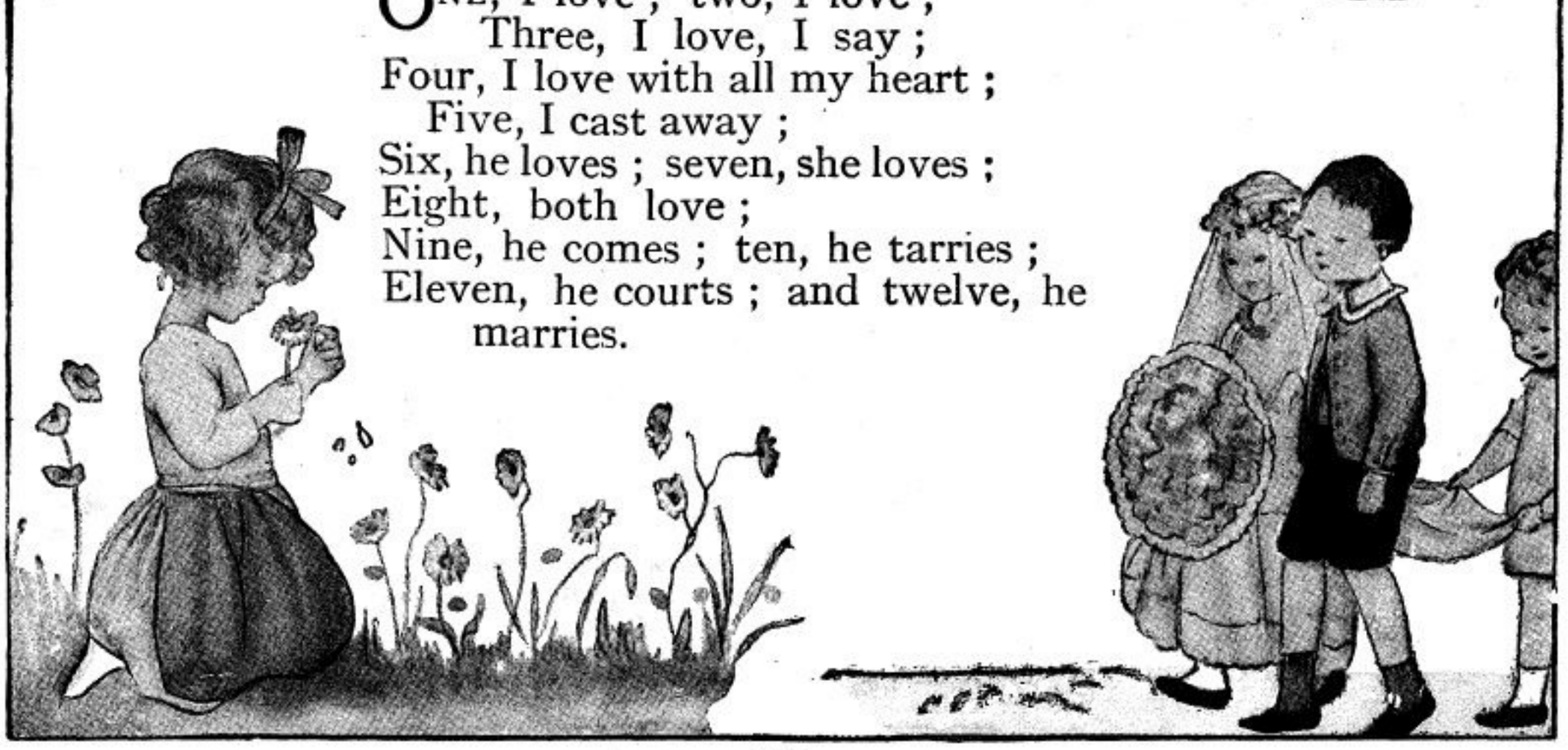
IF the old woman who lived in a shoe
Had lived in a cottage instead,
Her children could have played at hide-and-seek,
And needn't have been sent to bed.

If little Bo-Peep hadn't lost her sheep,
She wouldn't have had to find them.
If Little Boy Blue had not any sheep,
He wouldn't have had to mind them.



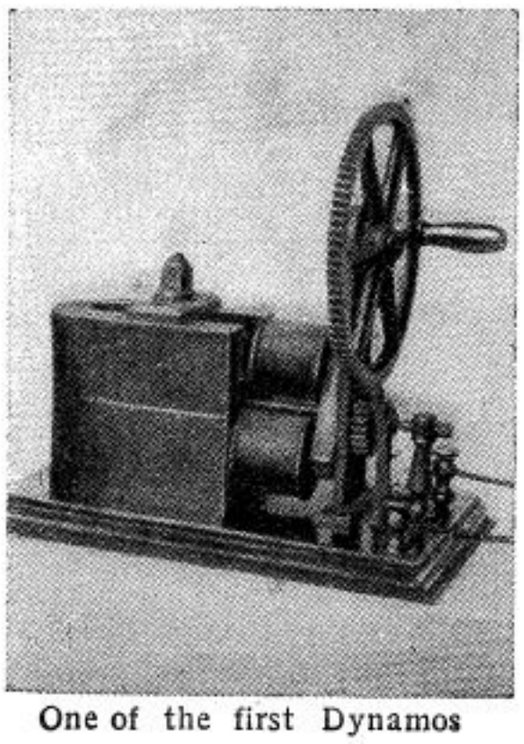
If the goose that laid the golden eggs
Had not been killed that day,
She'd still be laying golden eggs
As hard as she could lay.

In fact, if we could manage things,
How different they would be!
But as we can't, we'll let them stay
Just as they are, you see.

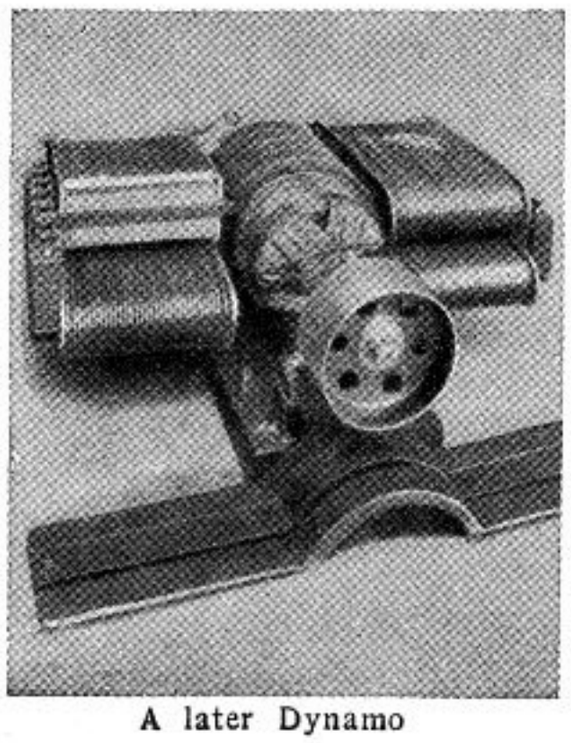


ONE, I love; two, I love;
Three, I love, I say;
Four, I love with all my heart;
Five, I cast away;
Six, he loves; seven, she loves;
Eight, both love;
Nine, he comes; ten, he tarries;
Eleven, he courts; and twelve, he marries.

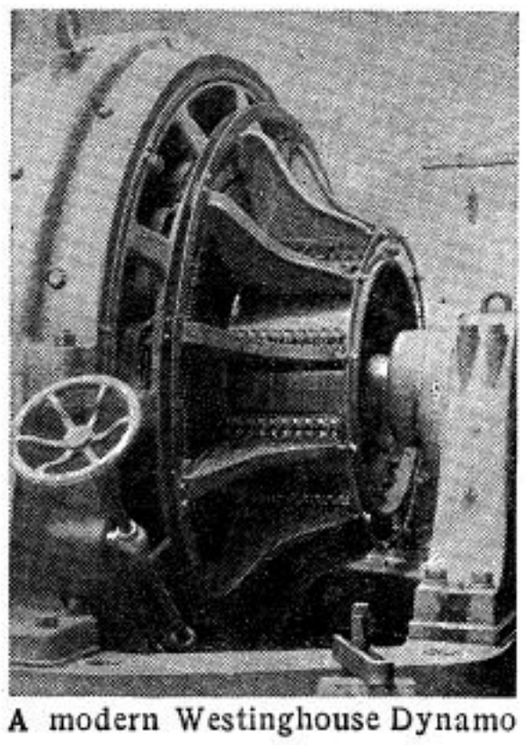
The Story of Where Power Comes From, What It Does, & How It Works



One of the first Dynamos



A later Dynamo



A modern Westinghouse Dynamo

THE STORY OF THE DYNAMO

IF you followed the little silk-covered twin wires from which an electric lamp is suspended, and could trace their path from the house into the underground tubes which run along below the street you would finally end up at the electric generating station; and these wires, together with a formidable bundle of other wires, would end in two huge cables joined to the switchboard of the *generator*. It is almost like following the pipe from a gas-lamp to the huge dome-shaped reservoirs familiar to us as the "gas-works." One central generating plant of sufficient size to supply the needs of a whole town distributes its power in the form of gas or electric current to the thousands of users, each of whom wants his own little quantity.

A great romance lies round the manufacture of the huge quantities of electricity needed to light the homes, run the trams, and supply the power for a town of tens of thousands of people. It is only possible as the result of combining the knowledge and discoveries of all the great men of science who followed the famous physician of Queen Elizabeth, Doctor Gilbert. As far apart as the poles of the Earth are the glowing sulphur ball of von Guericke—the first electric light—and the brilliant half-watt lamps which today illumine the shops in a busy street. Little by little, one discovery, one invention, has followed another, until we can today have installed in any place as much electric light as we want, or use as much electric power as is needed for the motors which run the electric trains and the machines of the factories.

The secret of the dynamo—the electric machine which produces this current—is very simple. If a coil of wire is joined to the poles of an electric battery, the coil acts as a magnet, the current producing a magnetic field. But if such a coil be itself moved about in the field of a magnet, an electric current is set up *within the coil.*

The dynamo is nothing more than a number of wire coils driven round between the poles of a powerful magnet, and as they cut the lines of force thrown out by it an electric current is set up which is collected in a way very similar to that of storing up the current from a frictional machine.

In the early dynamos the coil in which the electric currents were set up were revolved in the field of a steel horse-shoe magnet, but in order to obtain greater power an electric magnet excited by a battery was used. Later a great advance was made by actually taking some of the electricity created by the dynamo to excite its own magnet.

It must be understood that there are definite rules which magnets and coils obey when the coils are revolved in a magnetic field. According to the direction in which the coil turns, and its relation to the north and south poles of the magnet, the current will flow in a certain direction. When a coil has turned through half a circle it has become reversed, so to speak, and for the next half of the turn the current produced in it will flow the opposite way. Thus, in the simplest form of dynamo, the current is changed twice in direction during every revolution ; such a current is said to be *alternating*. The *armature*—the arrangement of coils used in a modern dynamo—can be so built up that the "brushes" which collect the current will produce either alternating or direct current.

To the electrical engineer direct current is essential for charging accumulators or storage batteries, for electro-plating, and for big arc lamps. Alternating current is equally necessary for long-distance transmissions ; it can be sent at a very high voltage with little loss over immense distances, and easily reduced to lower voltages at the point where it is used.

THE TERRIFIC PRESSURE OF ELECTRICITY AS IT COMES FROM THE DYNAMO

This brings us to the subject of the pressure of an electric current. Suppose we wanted to supply water from a tank through a pipe to some spot a long way off. We know that the tank would have to be higher up than the spot to which the water was being sent. The higher the tank was raised the greater would be the pressure of water, the better the driving force to send it through the pipe.

We can liken the dynamo to the water tank and the pressure of the current to the pressure of the water. Whereas water pressure is measured by saying there is so much *head* of water, electricity is measured by saying that its pressure is so many volts. In the early days of electric lighting a hundred volts was quite a usual pressure, but it was soon found that as electricity was sent over greater distances this pressure was not enough, and today it is usually 200, 220, 400, or more, for power supplies.

When the problem arose of sending electricity over really great distances, when electric power was generated by using the driving force of waterfalls and sending it to spots perhaps a hundred miles away, much higher pressures had to be used, and currents at more than a hundred thousand volts pressure are in use today.

Now, why does an electric current at 1000 volts pressure travel a hundred miles with less loss than one at 100 volts ?

The great pioneer Ohm discovered a law which is perhaps the most useful of all electrical laws. It is that when a current flows through any completed course, which we shall in future call a circuit, the amount of current is *equal to the voltage divided by the resistance*.

WATERFALLS AND RIVERS THAT DRIVE LARGE ELECTRIC GENERATORS

Three great philosophers gave their names to the units in which these electrical quantities are given : Ampère, Volta, and Ohm. Current is measured in *ampères*, pressure in *volts*, and resistance in *ohms*. If a current of one volt pressure flows through a circuit the resistance of which is only one ohm the current strength will be one ampère.

We can see, then, that if a current is sent through a wire of great length, having therefore great resistance, it will be greatly diminished in strength. But it is diminished less and less as the voltage is made bigger, so that for very long distances a really enormous voltage is used.

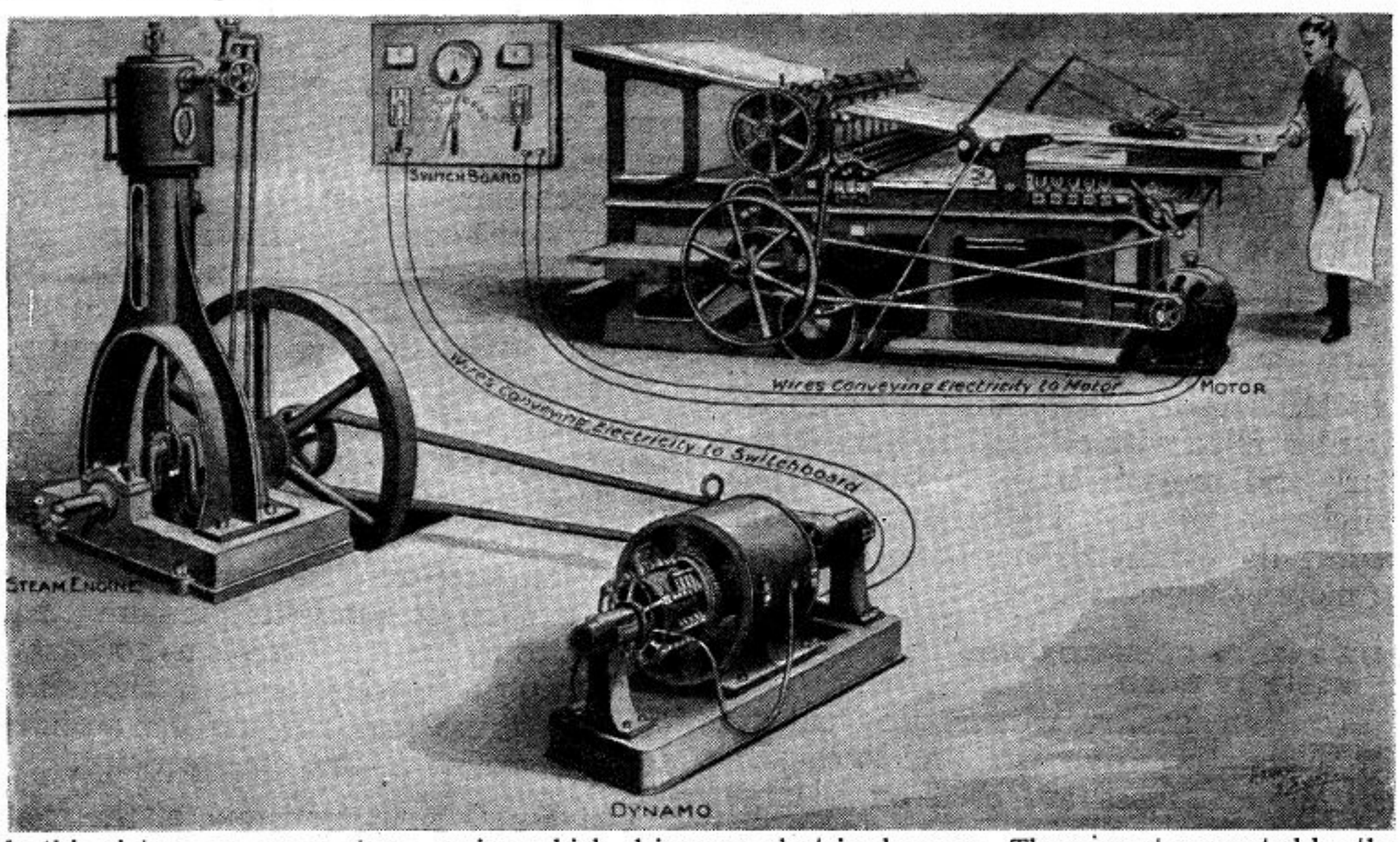
Tens of millions of horse-power are generated today by harnessing the natural power of waterfalls and swiftly-running rivers to drive water turbines. Modern water-wheels are as far ahead of the old water-wheels of the mill as the huge turbines of an Atlantic liner are ahead of the old-fashioned paddle-wheel in steamboats. These power turbines, driven by natural forces which have for centuries past flowed to waste, are made to drive large electric generators. But waterfalls and water-power are very rarely situated near a big manufacturing town or a big city which requires current for its lighting and its tramways.

HOW POWER IS CARRIED ALONG WIRES FIFTY OR A HUNDRED MILES LONG

The electricity has thus to be *transmitted* from the scene of the waterfall to towns and cities miles away—sent through wires perhaps 50 or 100 miles long. It is in such cases as these that high voltages are used, and the conducting wires are suspended from poles high up in the air, as to touch them would mean instant death. The poles themselves have to be made of steel

in many countries, to protect them from the attack of insects. These wires must be kept apart, too, as one wire, of course, conveys the positive electricity, the other the negative, and the two opposite kinds of electricity are always trying to come together. In damp weather, when the air conducts well, a bright glow can often be seen at night around the wires; it is the wonderful force which strives to jump from one wire to the other; indeed loss of electricity is involved through this effort.

The lower voltages customary in England are led through conductors underground,



In this picture we see a steam engine which drives an electric dynamo. The current generated by the dynamo flows to a switch controlling a motor, which in turn drives the printing press.

and it will be interesting to follow the course of the current from the switchboard at the generating station.

The first impression of a large power station is generally one of wonder that this huge force, driving the tramways of a city, supplying its myriad lights, and running the electric motors of its factories is being produced by a machine so calm and still. There is a peculiar majesty about a modern generator. At first sight it appears to be still—the only sensation of life that it gives is the buzzing, whizzing, or peculiar singing noise of its giant armature. This armature, bearing the coils of wires that cut across the line of force of the powerful electric magnets, seems at first sight to be still, but actually it is running round at immense speed. It is so beautifully balanced that its motion is smooth as the silent swell undulating in an oily sea. The most striking feature of a generating station is its apparent simplicity, its lack of complication; yet the winding and arrangement of the field magnet, the extraordinary complexity of the armature are things to wonder at even in the present stage of our electrical knowledge.

The switchboard of a generating station is like the office of a big factory. It collects the current from the dynamos and directs it into the conductors, and so to the points where it is put to practical use. On the switchboard we find:

1. Resistances (or rheostats), for regulating the voltage; as only a very definite voltage or pressure must be supplied.
2. Switches, with which the different dynamos are connected to what are termed the bus-bars.
3. Cut-outs for protecting the dynamos themselves and the wires that convey the current.
4. Instruments for measuring the amount of current produced, the power supplied, and the pressure of the current.

Very often the current is not supplied directly to the mains which carry the electricity to the consumer, but is poured, as it were, into a large storage battery, which in its turn supplies the current to the various users.

The dynamo does not, by any means, stand by itself in an electricity supply station. It is one thing to produce this great amount of current, another thing to distribute and control it. Special measures

have to be taken, too, to protect lighting circuits and motors provided with current from the effects of lightning.

If the two ends of a large battery or dynamo are made to touch each other, and then drawn a little way apart, an intensely powerful flame called an *arc* will flash between them, and may do considerable damage. The switch which makes or breaks the current from a dynamo has to complete the circuit, or make a break in the continuity of it; the current must have a metal path to flow through, or else be stopped by a gap of air, which does not conduct electricity. But the very making of this gap may "strike an arc," and the current would still flow across the flame, the hot gases of the burning metals acting as a conductor. Massive switches which break the continuity of both wires leading from the dynamo, and which break away the conducting parts with a quick jerk, are used. The parts which "make" and "break" are made to work in a metal chamber filled with oil so as to quench the spark and prevent it doing harm. The switchgear of the big power stations feeding the overhead lines of the grid are far more complicated.

THE SAFETY FUSE-BOX AND WHAT IT DOES

In case any positive wire should accidentally touch a negative wire, and so cause a short-circuit, fuses are used on a large scale. A home lighted with electricity is sure to have a fuse-box somewhere, containing a number of fuse-wires which protect the electric circuits from danger.

If a big current flows through a thin wire it will heat it to such an extent that the wire will melt. This is exactly how a fuse is made. Every here and there in lighting or motor circuits—in fact wherever electricity is used—the electrician puts a fuse-wire contained in a little porcelain box. This wire is often made of tin—which melts at a very low temperature—sometimes of other metals. If through any accident too much current flows through the circuit, the fuse-wire will melt, and an air-gap will be instantly made in the circuit, so that the current can no longer flow.

Much more elaborate fuses or "cut-outs" are used in circuits where really high power is being used, but the principle is always the same; as soon as an excessive current flows, something gives, and an air-gap is made in the circuit.

The wires leading from the generating station, known as the electric mains, are heavy copper cables carefully insulated and laid in wood, earthenware, or iron troughs under the ground. These tunnels are usually placed about fifteen inches below the footway, or twice that depth below roadways.

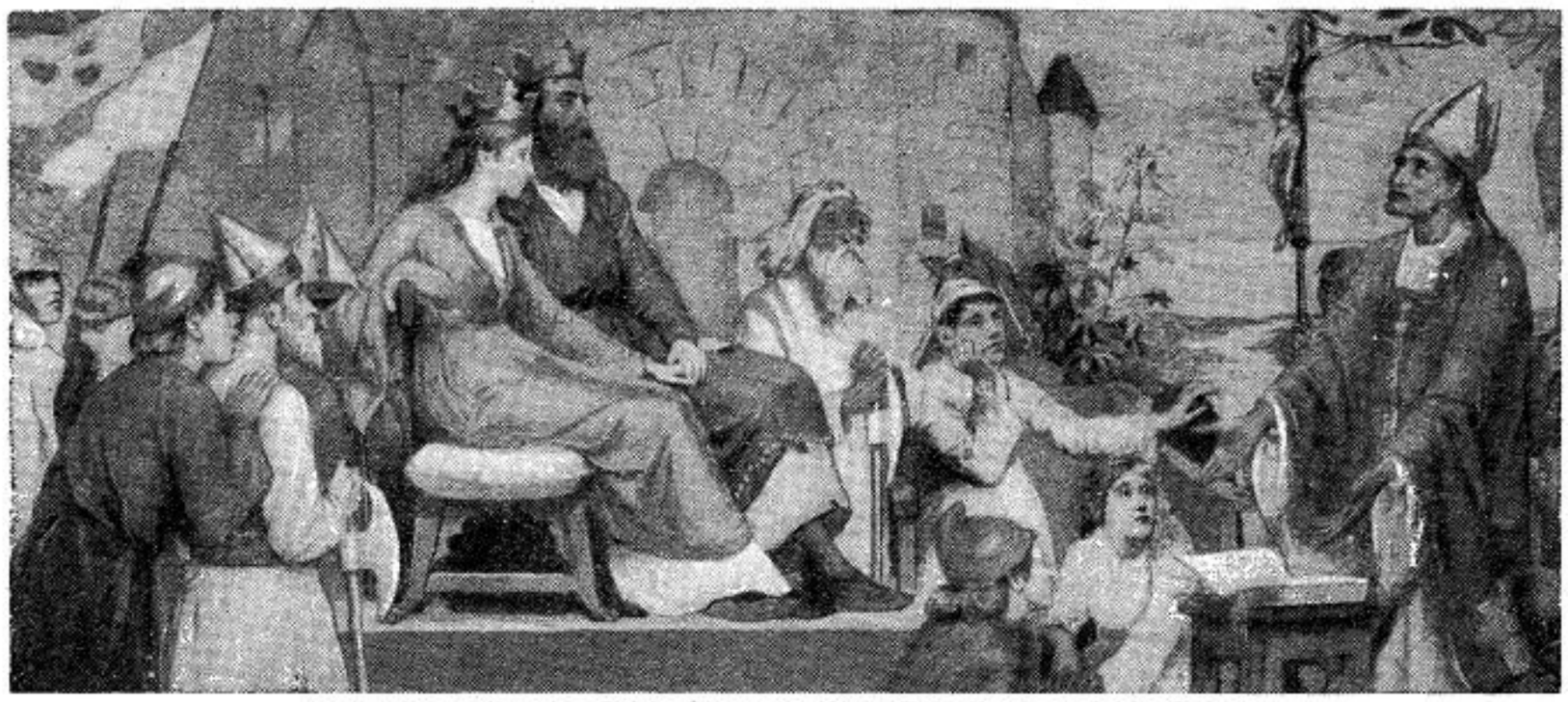
ONE OF THE MOST WONDERFUL INSTRUMENTS IN THE WORLD

Thus beneath our feet, as we tread the streets, are the sinews of the power that feeds the city or the village; the electric wires convey the mysterious force that can be instantly turned into light, or heat, or mechanical power. In each office, factory, or house the current must first pass through a meter, or measuring instrument, which keeps a record of all the current used. Coal gas is measured in therms (according to its heat), electricity in units. A unit means the use of a thousand watts for one hour. A watt means the flow of a current of one ampère at a pressure of one volt. A modern 20-candle-power lamp consumes a current of a tenth of an ampère at 200 volts pressure; 200 multiplied by one-tenth gives us 20 watts; 20 multiplied by 50 gives us a thousand. Thus fifty such lamps lighted for an hour would consume a unit of electricity.

The electricity meter is one of the most delicate, intricate, and wonderful instruments in existence today. Several different kinds of meter are in use, some depending on chemical action caused by the current, others on a motor made to turn and count by the current passing through it, and others, again, in which a clock drives a counting machine.

THE GREAT BUSINESS OF CONTROLLING AND DISTRIBUTING ELECTRICITY

The lighting of a lamp, or the switching on of an electric-motor, is thus by no means as simple a thing as it appears. Every unit of electricity has to be accounted for. The demand for current from hour to hour, from minute to minute, has to be watched by the engineer at the generating station. The electricity poured out by huge dynamos has to be controlled, directed, and distributed among some thousands of users.



Augustine tells the Bible Story to King Ethelbert and his Queen

THE BOOK AS SWEET AS MUSIC

We have said that the Bible is the most precious book in the English language, not only because of its religious teaching, showing how God has been revealed to mankind in truer ways as the ages have passed, but because, as a collection of books—written by many people living in many centuries, and now welded into one book—it has been translated into English so beautifully that its teaching has been set to the music of sweet words.

Here we want to show that this is so by looking at a few scenes, or teachings, and recalling the words in which they are described in our English Bible. We say there is no other book in which language is used so simply and sweetly, and with effects so profoundly true.

Take one of the earliest scenes—the finding of a wife for Isaac, Abraham's son, at least thirty-five centuries ago. When the account in the Book of Genesis was actually written no one knows, but it almost certainly was in existence 2750 years ago, and of all the books of the world not one tells a story more clearly or with greater charm.

Abraham was a very old man, and he wanted to see his quiet and studious son Isaac married to a wife of his own clan; but he had travelled a long way from the region where they pastured their flocks. So he sent a trusted servant to find a suitable wife, believing that God would guide him aright in his search. It is a pastoral desert scene that follows; we have slightly shortened the story here.

And it came to pass that Rebekah, the daughter of Bethuel, came out with her pitcher upon her shoulder. And the damsel was very fair to look upon, and she went down to the well and filled her pitcher and came up. And the servant ran to meet her, and said, " Let me, I pray thee, drink a little water of thy pitcher."

And she said, " Drink, my lord " ; and she hasted, and let down her pitcher on her hand and gave him drink. And when she had given him drink, she said, " I will draw water for thy camels also, till they have done drinking." And she hasted and emptied her pitcher into the trough, and ran again, and drew water for all his camels.

And the man, wondering at her, held his peace, to wit whether the Lord had made his journey prosperous or not. And it came to pass, as the camels had done drinking, that the man took a golden earring, and two bracelets for her hands, and said, " Whose daughter art thou? Is there room in thy father's house for us to lodge in? "

And she said, " I am the daughter of Bethuel. We have both provender and straw enough, and room to lodge in."

And the damsel ran and told them of her mother's house these things. And Rebekah

had a brother named Laban, and Laban ran out unto the well, and said, " Come in, thou blessed of the Lord ; wherefore standest thou without ? For I have prepared the house, and room for the camels."

Abraham's servant, thus offered entertainment, revealed his errand of finding a wife for his master's son, and finished, " And now, if ye will deal kindly and truly with my master, tell me ; and if not, tell me ; that I may turn to the right hand or to the left." And Bethuel answered and said, "Behold, Rebekah is before thee, take her and go, and let her be thy master's son's wife, as the Lord hath spoken."

ISAAC TOOK REBEKAH, AND SHE BECAME HIS WIFE, AND HE LOVED HER

Next morning, however, the girl's mother and brother counselled delay by saying,

" Let the damsel abide with us a few days, at the least ten ; after that she shall go." And he said unto them, " Hinder me not, seeing the Lord hath prospered my way."

And they said, " We will call the damsel, and inquire at her mouth." And they called Rebekah and said unto her, " Wilt thou go with this man ?" And she said, " I will go."

Here is the sequel, happy in itself, and as delightfully told :

And Isaac went out to meditate in the field at the eventide, and he lifted up his eyes and behold the camels were coming. And Rebekah lifted up her eyes, and when she saw Isaac she lighted off the camel. For she had said unto the servant, " What man is this that walketh in the field to meet us ? " And the servant had said, " It is my master." Therefore she took a veil and covered herself. And the servant told Isaac all things that he had done. And Isaac brought her to his mother Sarah's tent, and took Rebekah, and she became his wife, and he loved her ; and Isaac was comforted.

Many narratives equally graphic and charming are found throughout the Old Testament. From the period of the kingship one of the most striking of the literary outbursts is David's poetical lament for the fallen heroes, Saul and Jonathan, the most authentic of the songs attributed to the shepherd-king. It pictures the luxury of those early times ; also it expresses in agonised words the fate of those who take to the sword and perish by it.

LOVELY AND PLEASANT IN THEIR LIVES AND IN THEIR DEATHS NOT DIVIDED

The beauty of Israel is slain upon thy high places ;
How are the mighty fallen !
Tell it not in Gath ;
Publish it not in the streets of Askelon ;
Lest the daughters of the Philistines rejoice,
Lest the daughters of the uncircumcised triumph.
Ye mountains of Gilboa, let there be no dew,
Neither let there be rain upon you, nor fields of offerings ;
For there the shield of the mighty is vilely cast away,
The shield of Saul, as though he had not been anointed with oil.
Saul and Jonathan were lovely and pleasant in their lives,
And in their death they were not divided.
They were swifter than eagles,
They were stronger than lions.
Ye daughters of Israel, weep over Saul,
Who clothed you in scarlet, with other delights,
Who put ornaments of gold upon your apparel.
How are the mighty fallen in the midst of the battle !
O Jonathan, thou wast slain in thine high places.
I am distressed for thee, my brother Jonathan ;
Very pleasant hast thou been unto me ;
Thy love to me was wonderful,
Passing the love of women.
How are the mighty fallen,
And the weapons of war perished !

NO GOD LIKE HIM IN HEAVEN ABOVE OR ON EARTH BENEATH

The weakness of the Hebrew religion was its narrowness and bigotry. Too often it saw no room in God's favour for any except the Hebrew race. But that was not so in the prayer that is placed in the mouth of Solomon at the opening of his gorgeous temple.

And Solomon stood before the altar of the Lord in the presence of all the congregation of Israel and spread forth his hands towards heaven ; and he said, " Lord God of Israel, there is no God like thee in heaven above, or on Earth beneath, who keepest covenant and mercy with thy servants that walk before thee with all their heart.

" But will God indeed dwell on the Earth ? Behold the heaven and heaven of heavens cannot contain thee ; how much less this house that I have builded ? Yet have thou respect unto the prayer of thy servant, that thine eyes may be open to this house night and day ; and hearken thou to the supplication of thy servant and of thy people Israel, when they shall pray towards this place ; and hear thou in heaven thy dwelling place, and when thou hearest, forgive."

The most splendid minds that ancient Israel produced were those of the prophets who were in fullest activity from about the year 750 B.C. to 300 B.C. They sought to make religion lead to personal goodness instead of empty ceremony, and their eloquence resounds through the

oldest parts of the Bible—judging age by the time when the books were written, and not by the time about which they were written. Isaiah, the son of Amoz, was the prophet who most impressed his countrymen, by appeals like this :

Hear, O heavens, and give ear O Earth : for the Lord hath spoken. " I have nourished and brought up children and they have rebelled against me. The ox knoweth his owner, and the ass his master's crib; but Israel doth not know, my people doth not consider."

THE OUTLOOK OF THE HEBREWS WIDENED BY THEIR CAPTIVITY

To what purpose is the multitude of your sacrifices to me ? saith the Lord : I am full of the burnt offerings of rams, and the fat of fed beasts ; and I delight not in the blood of bullocks, or of lambs, or of he-goats. When ye come to appear before me, who hath required this at your hands to tread my courts ? Bring no more vain oblations ; incense is an abomination unto me ; the new moons and sabbaths, the calling of assemblies I cannot away with ; it is iniquity, even the solemn meeting. Wash you, make you clean ; put away the evil of your doings from before mine eyes ; cease to do evil ; learn to do well ; seek judgment, relieve the oppressed, judge the fatherless, plead for the widow.

The carrying away of the Hebrews into Babylon had a great effect on them. They learned much there. Their outlook widened. Their view of God as majestic in power yet kind, the ruler of all the sons of men, was expressed in glorious strains ; and as the time for the return to Palestine grew near, the feelings of the poet-prophets were expressed in rapturous outbursts. The splendid fortieth chapter placed under the name of Isaiah was an encouraging prelude to the journey back across the desert from Babylon to Jerusalem. It is to meet these circumstances that the prophet exclaims :

Comfort ye, comfort ye my people, saith your God. Speak ye comfortably to Jerusalem, and cry unto her that her warfare is accomplished, that her iniquity is pardoned ; for she hath received of the Lord's hand double for all her sins.

SAY UNTO THE CITIES OF JUDAH, BEHOLD YOUR GOD

The voice of him that crieth in the wilderness, Prepare ye the way of the Lord, make straight in the desert a highway for our God. Every valley shall be exalted, and every mountain and hill shall be made low ; and the crooked shall be made straight and the rough places plain ; and the glory of the Lord shall be revealed, and all flesh shall see it together, for the mouth of the Lord hath spoken it.

O Zion, that bringest good tidings, get thee up into the high mountain ; O Jerusalem, that bringest good tidings, lift up thy voice with strength ; lift it up, be not afraid; say unto the cities of Judah, Behold your God !

He shall feed His flock like a shepherd; He shall gather the lambs with His arm, and carry them in His bosom, and shall gently lead those that are with young.

At this time, too, began those sublime views of God as the omnipotent Creator which ever afterwards continued through the best Hebrew literature, and showed traces of the study of astronomy and a vison of a universe wider than the Earth. This had been gained on the Mesopotamian plain during the exile.

Who hath measured the waters in the hollow of his hand, and meted out heaven with the span, and comprehended the dust of the Earth in a measure, and weighed the mountains in scales and the hills in a balance ? Behold, the nations are as a drop of a bucket, and are counted as the small dust of the balance ; behold, he taketh up the isles as a very little thing. To whom then will ye liken me, or shall I be equal, saith the Holy One. Lift up your eyes on high, and behold who hath created these things, that bringeth out their host by number ; he calleth them all by names by the greatness of his might, for that he is strong in power ; not one faileth.

THE IDEA OF GOD AS CREATOR OF THE UNIVERSE

The same note is heard again and again in the later psalms :

The heavens declare the glory of God ;
And the firmament showeth his handywork
Day unto day uttereth speech,
And night unto night showeth knowledge.
There is no speech nor language
Where their voice is not heard.

It vibrates through that later drama, the wonderful Book of Job :

Where wast thou when I laid the foundations of the Earth ?
Declare, if thou hast understanding.
Whereupon are the foundation stones thereof fastened ?
Or who laid the corner stone thereof ;
When the morning stars sang together
And all the sons of God shouted for joy ?
Canst thou bind the sweet influences of the Pleiades,
Or loose the bands of Orion ?
Canst thou bring forth Mazzaroth in his season ?
Or canst thou guide Arcturus with his sons ?

The beauty in style that makes the Bible first among all books is in no way lessened when the change is made from the Hebrew

Old Testament to the Christian New Testament. Almost any narrative will serve as an illustration, but take one where description is interwoven with profound teaching:

He left Judaea and departed again into Galilee; and he must needs go through Samaria. So he cometh to a city of Samaria called Sychar, and Jacob's well was there. Jesus, therefore, being wearied with his journey, sat thus by the well. It was about the sixth hour. There cometh a woman of Samaria to draw water. Jesus saith unto her, Give me to drink. For his disciples were gone away into the city to buy food.

THEY THAT WORSHIP HIM MUST WORSHIP HIM IN SPIRIT AND IN TRUTH

The Samaritan woman therefore saith unto him, How is it that thou, being a Jew, askest drink of me, which am a woman of Samaria? (For the Jews have no dealings with the Samaritans.)

Jesus answered and said unto her, If thou knewest the gift of God, and who it is that saith to thee, Give me to drink, thou wouldst have asked of him, and he would have given thee living water.

The woman saith unto him, Sir, thou hast nothing to draw with, and the well is deep; from whence then hast thou that living water? Art thou greater than our father Jacob, who gave us the well, and drank thereof himself, his children and his cattle?

Jesus answered and said unto her, Whosoever drinketh of this water shall thirst again. But whosoever drinketh of the water that I shall give him shall never thirst; but the water that I shall give him shall be a well of water springing up into everlasting life.

The woman said unto him, Sir, I perceive that thou art a prophet. Our fathers worshipped in this mountain; and ye say that Jerusalem is the place where men ought to worship.

Jesus saith unto her, Woman, believe me, the hour cometh when ye shall neither on this mountain nor yet at Jerusalem worship the Father. But the hour cometh, and now is, when the true worshippers shall worship the Father in spirit and in truth, for the Father seeketh such to worship him. God is a Spirit; and they that worship him must worship him in spirit and in truth.

THE BEAUTIFUL STORIES IN THE NEW TESTAMENT FULL OF DEEP THOUGHT

Simple, graphic, deep, here is the true union between natural narrative and profound thought. Among the many examples of exquisite New Testament narrative that may be read, in all the Gospels, stands high the description of Peter's denial of the Lord, especially in Luke's account, where the Lord is described as turning and looking at Peter, whereupon he went out and wept bitterly.

Or, again, for plain, yet unsurpassed telling of a story, take the account of Paul's shipwreck on the island of Malta in the last chapter but one of the Acts of the Apostles. For argument in a style of transcendent dignity there is the discussion of immortality by Paul in I Corinthians 15, used in the burial service.

But, in truth, from the noble poetic vision of the Creation in Genesis—not in date of writing one of the earliest parts of the Bible—to the Revelation, with its poetic picture of a future beyond death, the beauty of the writing of the Bible is at times divine, and it is felt the more if we know something of the circumstances surrounding the writers who, in a rapture of vision, poured forth their eloquence.

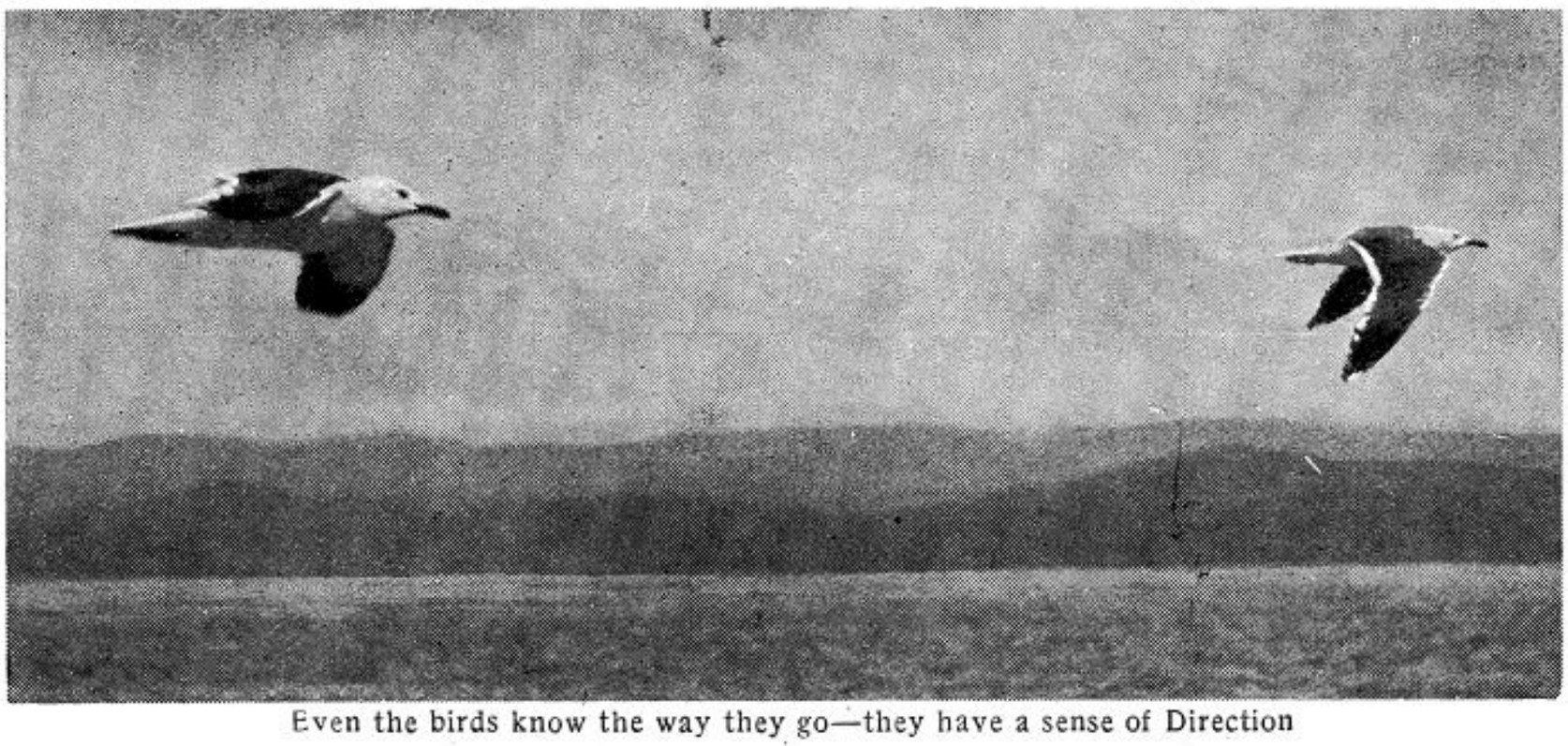
A last instance may fitly be taken from the closing book of the Bible. Apocalyptic writings—visions of the future, as seen in dreams, chiefly comforting—were very common during the centuries immediately before and after Christ.

THE RICH SIMPLICITY AND IMAGINATION OF THE EASTERN MIND

Such writings took that form often because it was safest, perhaps the only safe way. Thus the revelation attributed to St. John is a concealed denunciation of Nero, a commemoration of innumerable martyrs, and an appeal to Christians who expected and often hoped for martyrdom, and who finally believed that the end of the world was close at hand. These writings were the uplifting call of faith to myriads to whom Christianity meant suffering and death. Of them it was asked:

These which are arrayed in white robes, what are they, and whence came they? These are they which came out of great tribulation, and have washed their robes and made them white in the blood of the Lamb. Therefore are they before the throne of God and serve him day and night in his temple; and he that sitteth on the throne shall spread his tabernacle over them. They shall hunger no more, neither thirst any more, neither shall the Sun strike upon them nor any heat; for the Lamb which is in the midst of the throne shall be their shepherd, and shall guide them unto living fountains of water; and God shall wipe away all tears from their eyes.

Only through the Bible do we come into close and intimate touch with the refined imagination of the Eastern mind, and its expression in a rich simplicity that has gloriously haunted the strong but rugged speech of our British race.



Even the birds know the way they go—they have a sense of Direction

DIRECTION

ONE of our greatest men of science said to us in conversation one day that two of the words which helped him most in his thinking were the words Direction and Personality. Let us now think a little about Direction.

Suppose you stood by the side of a motor-car and set it going. You would see it start off along the road just as if someone was steering it. But soon it would swing to the left, then swerve to the right, and finally crash violently against an obstacle on the wayside.

But if you saw in the distance another car approaching you, which kept to its path and steered intelligently past obstacles, you would say to yourself : " There is a man at the wheel, directing it."

You will often see a baulk of timber floating in the sea. It goes hither and thither. It has no power in itself. No one is steering it. The waves wash over it, the tide bears it onward, and the currents carry it whither it knows not. How differently does a steamship move through that waste of waters ! It may be steered by a man on the bridge, or even by a man in an aeroplane overhead ; but so long as it is steered by a mind it will follow a certain direction. It will not be at the mercy of winds or waves. It will triumph over the set of the tide. It will avoid rocks and shoals. It will arrive.

Now, when we come to consider the works of Nature we see in everything signs of a direction. It is quite plain to us that the sea does not move like the log of wood floating on its waves, or that the seasons of the year do not move like a motor-car without a driver. They may not be always the same. The sea may be rough at one moment, and smooth at the next. Summer may one year be cold and wet, winter in that year may be warm and muggy ; but all the same there is a certain direction in the seasons. They are not permanently in disorder. Nature never appears to us in the least like a motor-car without a driver or a baulk of timber floating in the waves.

Moreover, we go back in our minds to a past which no man can measure, and we see this planet roaring round the Sun in sheets of flame. We look at it with the mind's eye, and watch it cool down, and see the atmosphere enfolding it, the water shining on its surface, the green herb appearing on the marge of those waters, and Life appearing out of the deep.

We say to ourselves : " There is a movement in Nature. Things are changing. The planet is no longer like an oven ; it

is more like a garden. Someone must be steering this movement, for it is not only movement; it is movement with direction." This seems sensible. But someone comes along who loves to argue, and he says to us, "It is true things are changing; it is true things could not change without movement; but why should you say *someone must be steering this movement*? Is it not the movement itself which does everything?"

NATURE NOT A TOPSY-TURVY CHAOS BUT AN ORDERLY MOVEMENT

This sounds as if it might be true. We cannot see anyone steering the movement. Suppose, after all, there is a movement which steers itself, a very odd movement, to be sure, but a bare possibility. Then someone else comes along and says:

I have been studying the movement of Nature, and I have come to the conclusion that it is following a very remarkable direction.

It is not moving aimlessly. It is seeking something. It is like a man who has lost his way and is trying all sorts of paths to reach his goal. Or it is like a woman who has lost a coin in her house and is searching through all the rooms to find it.

What Nature is seeking I cannot say for certain, but she is seeking *something*, and it looks to me as if she were struggling to reach beauty and power. She was not content with grass: she must have the violet and the rose. She was not satisfied with the jellyfish, she must have the elephant.

At any rate, I am quite convinced that Nature is not a topsy-turvy chaos, but an orderly movement following an intelligent direction.

We now begin to see light. If we would discover our mystery we must study the character of the movement in Nature. Then we shall be able to say something about the direction it is following. There is movement. But what is its character?

NATURE ON THE SIDE OF COOPERATION AND OPPOSED TO SELFISHNESS

Watch this movement of Nature and you will at once notice a very strange thing about it. It produces with infinite care a number of living forms *only to fling them away*. Dig down into the earth and you will find the fossil remains of marvellous creatures nowhere now to be found among the living. They have been cast away. You will notice that a number of other living creatures are dying out, as if Nature no longer bothers about them. Our museums and zoos collect these things and preserve them because they are dying out, which means that Nature has now no use for them.

Let us look at the things which Nature does appear to want, the things she really does care about. There are plenty of bees and plenty of flowers, plenty of sheep and plenty of green fields, plenty of men and plenty of corn.

What strikes us about these things? They are useful to one another. The bee helps the flowers, and the flower helps the bee. The sheep helps the grass, and the grass helps the sheep. Men help wheat, and wheat helps men.

It is quite different with tigers and wolves and eagles. They think only of themselves. They kill and destroy. They help nothing. It looks, then, as if this movement in Nature is *on the side of Co-operation and opposed to Selfishness*. Nature wanted swiftness and produced the tiger; but the tiger used its swiftness only for selfish purposes, and Nature abandoned it.

Well, then, it looks as if the natural movement is moral. It is not following a bad direction, but a good one. It does not want creatures to help themselves, but to help one another.

Look closer at this movement. Is it on the side of intelligence or stupidity? Is it trying to produce foolish things or wise things? Is it struggling to make Matter act reasonably or unreasonably?

THE MIND DIRECTING LIFE TOWARD TRUTH, BEAUTY, GOODNESS

We have only to think of the marvellous instinct in animals, insects, and plants to answer that question. Instinct! What a wonderful word! How comes it that these creatures possess so extraordinary a power? How could the movement in Nature produce this instinct if it was not itself intelligent?

Let us take a look at man. What is it that first strikes us about our fellow-creatures? We say, This man is good, and that man is bad. We mean by such a division that some men are following a wise direction and some are following a foolish direction. All the difficulties of life are made by the men who are following a foolish direction: all the hopes of making the world happy and prosperous are raised by men who are following a wise direction.

People who love to argue say: "Why should you say good and bad: good is only your idea of what suits you, and bad is your idea of what does not suit you." They wish us to think that goodness is simply an idea of man, and that badness is

not really so important as good people would make out. This is what we call shallow thinking. We can prove how shallow is such thinking. In Russia and Ireland large bodies of people have agreed that murder is not a crime, and that stealing is a thing which may be practised with impunity by those who are armed. What is the result? Civilisation in those unhappy countries is brought to a standstill. Immorality means barbarism, anarchy, and stagnation.

No State can exist which is not founded on morality. You may have a low condition of morality or a high condition, but you must have morality of some kind or other before you can organise a State. There must be certain things which a man may do, and certain things he may not do. It is impossible to think of a civilisation composed of bad people. Goodness is essential to order and progress.

Ask yourself, What is goodness? You will find that it is a striving after perfection. This movement in the soul of man is not only intelligent, it is moral: it seeks to attain Excellence.

THE MOVEMENT IN NATURE AWAY FROM BADNESS AND TOWARD GOODNESS

Thus we find throughout Nature a movement away from badness, and toward goodness. This movement is so wonderful in producing beauty and virtue that we cannot believe it would produce badness. Is it possible to think that the same movement which produced the cowslip and the gazelle, the shining star and the soul of Florence Nightingale, also produced the many hideous and abominable things we find in Nature? Is it so tremendously powerful and so infinitely stupid?

No; it is easier to think that this movement produces nothing of itself, that it was set in motion by a Mind, and that the badness in the world is the result of opposition to this movement. The movement can do nothing without the cooperation of that which it seeks to move. The Mind of the Universe wants truth, beauty, goodness: it sets a movement in motion directed to these ends; the movement encounters the opposition of Matter and is twisted out of its path—it cannot go on by itself; but elsewhere it presses forward, and where it meets with cooperation it produces the loveliness of Nature and the grandeur of the soul of man.

Wheat was given the direction which led to producing more wheat; the rose was given the direction which led to beauty and scent; and man was given the direction which led to reason and love. It is the opposition of matter, not the movement, which produces disease in the wheat, canker in the rose, and sin in man. It is not the nature of wheat to be barren, of the rose to die in bud, of man to be bad. These things only prove that the direction has not been followed.

THE GOAL THAT IS SOMETIMES FAR OFF AND DIFFICULT TO SEE

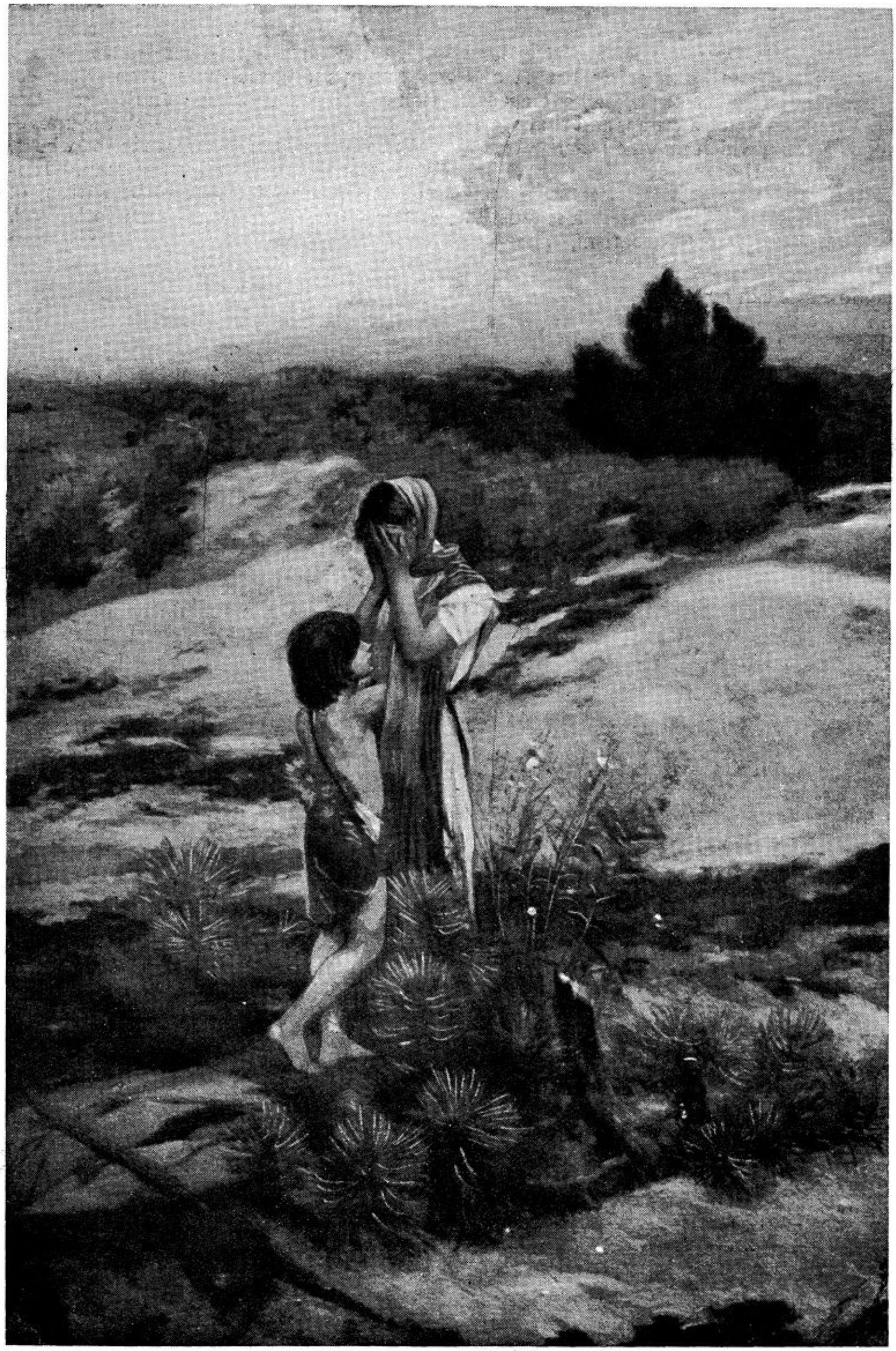
In many cases, it is true, it is difficult to find the final goal of direction; it may, indeed, be centuries away, and the path to it may be dark and hazardous, but we may at least be sure that there is a divine directing influence everywhere at work, that morality and intelligence are the forces behind the evolution not only of our little world but of the whole universe, and that there is, indeed, "one far-off divine event to which the whole Creation moves"—an event which we may faintly imagine in our ideas of truth, goodness, and beauty.

Now we see why the word Direction is so helpful to right thinking. It enables us to say that the universe in which we find ourselves is moral and intelligent. We are not entirely in the dark. We are not lost in a maze of confusion and perplexity. Behind movement is a Mover; behind things is a Mind. We may not know the final answer to all our questions, but because we know that there is a movement in Nature from anarchy to order, from ugliness to beauty, from selfishness to cooperation, from ignorance to knowledge, from weakness to power, from instinct to reason, we may at least be certain of this, that Life is a grand thing and a glorious thing; we may at least confess that we can help the Mind of the Universe, or hinder it, according to the direction of our own lives.

THE WISE TRAVELLER WHO WILL ONE DAY ARRIVE

The wise traveller is he who makes sure of his goal before he sets out on his journey. He may make more mistakes than the man who is on the wrong road, but at least his face is set in the right direction, and one day he will arrive at the place where he would be. Direction is the soul of living. It is what men call Destiny.

THE BITTERNESS OF HAGAR IN THE DESERT



HAGAR AND HER SON ISHMAEL IN THE WILDERNESS—From a photograph by Braun and Company

The Story of the Most Beautiful Book in the World

ABRAHAM, THE FRIEND OF GOD

In the early days of history a procession of men and camels was seen crossing the vast Syrian desert from the direction of Mesopotamia. Among the men was a tall and noble chieftain named Abraham, whose eyes often gazed across the terrible desert as though in quest of some end to his journey. By his side went a younger man, his nephew, named Lot.

It was a sad journey they were making, and only the iron will of Abraham kept the others to their duty. For this caravan was moving away from their homes, from their friends, from people who spoke their own language, and whose customs were the same as their own; and they were journeying to discover a new country, where everything would be strange to them, and where they might encounter enemies and treachery, and meet with slavery or death.

We can understand how Abraham's wife Sarah listened on her camel's back to the murmurs of her women, and sometimes shared their terrors. When at each day's end the tents were set up and the camels knelt down to rest on the sand, when darkness fell across the great round circle of the desert, and under the shining stars men and women sat silently round the fires thinking of the comfortable homes they had left behind, Abraham's young nephew Lot would, we can imagine, look toward his uncle, and feel rebellious in his heart.

But no one dared to withstand this splendid king of men, Abraham. He had seen a vision. God had spoken to him in a dream, and he was following his dream. How the men and women must have looked across the dark of the encampment toward this old, stern man, with the fire-light on his rugged face and sweeping beard of snow—this old man who believed the God of heaven had spoken to him—this old man who was following his dream across the desert!

These were the words Abraham declared God had addressed to him:

> Get thee out of thy country, and from thy kindred, and from thy father's house, unto a land that I will shew thee. And I will make of thee a great nation, and I will bless thee, and make thy name great, and thou shalt be a blessing. And I will bless them that bless thee, and curse him that curseth thee; and in thee shall all families of the Earth be blessed.

It was this command, this magnificent promise, which kept Abraham upon his way. The end of the long journey came at last, and Abraham found himself in Palestine, a lovely and a fertile country, beautiful to the eye and comfortable to the heart. Glad and grateful were the hearts of his company

as they gazed upon this gracious country. Here he settled, he and all his people, and they grew very rich, and fortune smiled upon them. But so rich and powerful did they become that jealousy crept in between the shepherds and herdmen of Abraham and the shepherds and herdmen of Lot, his nephew.

HOW ABRAHAM PARTED FROM LOT HIS NEPHEW AND BEFRIENDED HIM

Then Abraham said to his nephew :

Let there be no strife, I pray thee, between me and thee, and between my herdmen and thy herdmen, for we are brethren. Is not the whole land before thee ? Separate thyself, I pray thee, from me. If thou wilt take the left hand, then I will go to the right ; or if thou depart to the right hand, then I will go to the left.

These gracious words were spoken on a high tableland ; and Lot, turning from his uncle, looked down to the beautiful valley south of the Jordan, stretching far away in richness and loveliness, and promising great happiness and wealth. This was his choice, and Abraham parted from his nephew with love and kindness.

Afterwards, when he heard that his nephew had been involved in a great war and had been carried away a prisoner, Abraham did not forget him, but armed his servants and went in pursuit of the captors. Abraham prevailed against them, and the kings who rejoiced in his victory would have given him gifts ; but Abraham refused, saying that he would take nothing, " from a thread even to a shoe-latchet." He sought nothing but to do his duty and wait upon the will of God.

So he returned to his pastoral life, and again God visited him in visions, with the assurance that his children should inherit the Earth.

ABRAHAM'S WIFE AND HAGAR THE LITTLE EGYPTIAN MAID

In the midst of this peaceful and pleasant existence, Sarah, the wife of Abraham, had many sad and tragic thoughts. She was, as we shall see, a strange mixture of strength and weakness, kindness and unkindness. We know that she was beautiful, for a king of Egypt had greatly desired her for his wife, and we know that Abraham was devotedly in love with her. She must have thought many times of God's promise that Abraham's children should inherit the earth ; and as the days went by, and no son came, she began at last to fear that she was unworthy of Abraham.

In those days men married more than one wife, and Sarah went one day to Abraham and persuaded him to take for a second wife a little Egyptian maid in her service, named Hagar.

She said to Abraham, " Marry my slave-girl, and perhaps she will give us a son for our home." So Abraham did what his wife said.

When poor Hagar found herself so honoured she was at first a little proud, and her pride made Sarah angry. Sarah drove her out with angry words, and the poor slave-girl who had been so proud found herself an outcast in the wilderness. While she was weeping there, God sent a messenger to tell her to return to Sarah. " Return to thy mistress, and submit thyself under her hands," said a Voice in the wilderness. And the frightened slave-girl exclaimed, in words that ever since have been spoken in all languages, in all countries, " Thou God seest me." She went back obediently and submitted herself to the harshness of Sarah.

THE THREE MYSTERIOUS STRANGERS WHO APPEARED TO ABRAHAM

One day, as Abraham sat in the door of his tent, when the sun was at its highest, and the land lay dazed in an Eastern noon, there suddenly appeared before him three strangers. Abraham rose, struck by their wondrous appearance, and received them with the highest honour. While he was entertaining these visitors, one of them foretold that Sarah should have a son.

We can imagine the joy of the old father and the old mother. The preparations made by the rejoicing parents for the feast when the child Isaac was born passed everything they had ever done in splendour and magnificence. Sarah was just as excited as Abraham, and she laughed often in her joy, and gave herself up to the glory of the feast.

And Ishmael, Hagar's son, the lad who hitherto had been everything to Abraham, looked on at all this and laughed mockingly, so that Sarah, in a sudden outburst of rage, called to Abraham, " Cast out this bondwoman and her son ; for the son of this bondwoman shall not be heir with my son."

Abraham grieved because of his son Ishmael ; but a Voice comforted him, saying, " Let it not be grievous in thy sight because of the lad, and because of thy bondwoman ; in all that Sarah hath

THREE FIGURES IN ABRAHAM'S STORY

REBEKAH AT THE WELL—FROM THE FINE PAINTING BY FREDERICK GOODALL, R.A.

HAGAR, THE EGYPTIAN SLAVE GIRL, AND MOTHER OF ISHMAEL

ABRAHAM SENDS OUT HAGAR AND HER LITTLE LAD—FROM A SEVENTEENTH-CENTURY PAINTING IN THE BRERA GALLERY, MILAN

said unto thee, hearken unto her voice; for in Isaac shall thy seed be called. And also of the son of the bondwoman will I make a nation, because he is thy seed."

Abraham listened to this Voice in his soul, and he trusted it. He brought himself to the agony of parting with his son, the gay and spirited young Ishmael.

There is something touching in the brief story of this parting. Abraham rose up "early in the morning," evidently before his angry wife was stirring, and, providing poor Hagar and his son with food and water, took a loving farewell of them, telling them, we may be sure, of God's promise, and watching them through tears in his eyes as they departed.

Alas! for poor Hagar. She set out very sorrowfully, making no protest, but quietly submitting to her hard fate. And when her food and water came to an end, and they could go no farther, she laid her son down and went a good way off from him, saying, "Let me not see the death of the child." And she wept.

THE SORROW OF POOR HAGAR AND THE TERRIBLE TRIAL OF ABRAHAM

And God heard the voice of the lad; and the angel of God called to Hagar out of heaven, and said unto her, What aileth thee, Hagar? Fear not, for God hath heard the voice of the lad where he is.

Arise, lift up the lad, and hold him in thine hand; for I will make him a great nation.

And God opened her eyes, and she saw a well of water; and she went and filled the bottle with water, and gave the lad drink.

And God was with the lad; and he grew, and dwelt in the wilderness, and became an archer.

And he dwelt in the wilderness of Paran; and his mother took him a wife out of the land of Egypt

But another and a greater sacrifice lay before Abraham. A vision came to him, and the Voice to which he had always listened obediently seemed to tell him to take his son Isaac and offer him as a burnt offering on the mountains.

What a frightful command! How Abraham must have shrunk from it! We can imagine how he tried to persuade himself that it was not God who had spoken to him; that it was only a dream, a thing he should put out of his mind and forget. Many a man, even a pious man, who is confronted with a painful duty, manages to persuade himself that God could not mean him to make such a great sacrifice. He shuts his ears, as it were, to the Voice of God, and listens to the pleadings of his own wishes and desires rather than to the commands of duty. But Abraham was honest with himself; the command was terrible, but his glory was that he trusted in God, and he felt the voice to be from God.

ABRAHAM TELLS ISAAC THAT GOD HIMSELF WILL PROVIDE A SACRIFICE

So he rose up early in the morning and saddled an ass, and split wood for the fire, and took with him Isaac and two young men, and started out upon his journey of death. At the end of three days in the mountains he said unto his young men, "Abide ye here with the ass, and I and the lad will go yonder and worship, and come again to you." Then Isaac said suddenly, "My father! Behold the fire and the wood; but where is the lamb for a burnt offering?" And Abraham, in great trouble, answered, "My son, God will provide Himself a lamb for a burnt offering."

Then Abraham made an altar, laid the wood upon it, and took Isaac into his arms, and laid him for a lamb upon the altar. But just as he was about to slay this beautiful victim, a Voice sounded to him from heaven. He looked up from the angry mountains to the rolling clouds of dawn, and the Voice said, "Lay not thine hand upon the lad, neither do thou anything unto him; for now I know that thou fearest God, seeing thou hast not withheld thy son, thine only son, from Me."

This was the last trial of Abraham's splendid and almost terrible faith. He did not know, as we know now, that God is a loving Father. He thought of God simply as great and powerful.

ABRAHAM KNEW THAT GOD WOULD FULFIL HIS PROMISES

The rest of Abraham's life was calm and beautiful. He lived to see his son Isaac married to one of his kindred, the beautiful Rebekah; and when he died he was laid by the side of his wife in the cave of Machpelah.

He did not know how the nations of the Earth were to be blessed through Isaac; but it is quite certain that he was not curious about this, and contented himself with the knowledge that God would fulfil His promises. How those promises were wonderfully fulfilled we shall see.

FEEDING THE BIRDS

THE cold weather is coming and the birds are not able to find so much food.

Every boy or girl who is fond of birds should try to do something to help them during this season of the year, when fields and hedges are bare, and in doing so we may get a great deal of delightful amusement for ourselves by studying the little feathered creatures at close quarters. All we need is a bird table, and no matter where we live we shall soon have a crowd of little guests ready to enjoy our hospitality.

The bird table is quite simple to make. We get an old soap box and saw up enough of the wood to make a board about two feet long by a foot and a half wide, joining the pieces together or screwing two battens across them.

Turning the board up the other way we fix on to it four French nails, and using these as miniature posts tie several lengths of black cotton round and round like a little wire fence.

This is to keep the greedy sparrows away, so that the more interesting birds may have an opportunity of getting some food.

Now we make a hole at each corner of the table and run a string through to hang it up by. The best place to choose is on a verandah outside a window; or we can perhaps fix a staple in a wall, put a bamboo pole in the staple, and hang the bird table from the end of the pole. In this way we have it quite near to the window and can watch the birds having their meals, and study their habits and appearance.

As to the food, almost anything will be welcome. Fat, suet, cheese, table scraps, breadcrumbs, coconut and other nuts, apples, and potatoes are all eagerly consumed by the feathered visitors. A baked potato, warm but not hot enough to frighten them, seems to be particularly welcome to some of the birds.

Chaffinches, great tits, cole tits, blue tits, marsh tits, starlings, song thrushes, robins, and blackbirds are all very familiar and frequent visitors to the bird table. Others, though more cautious, can be attracted, such as rooks, jackdaws, hooded crows, magpies, hawfinches, greenfinches, bramblings, bullfinches, nuthatches, missel thrushes, pied wagtails, grey wagtails, ringdoves, greater spotted woodpeckers, moorhens, partridges, pheasants, and herring gulls. Of course, all these are not to be seen on the bird table in every part of the country, but there is nowhere, not even in the heart of London, where several kinds of birds cannot be attracted.

Even in the heart of London robins, tits, wood-pigeons, thrushes will come regularly to the bird table.

And all the year round the birds will come. A delightful sight is to see a number of tits hanging, back downward, on nuts put out for their benefit, eagerly devouring the fruit. Brazil nuts, almonds, or walnuts are best for this purpose, and, after being cracked and having best part of the shells removed, they should be tied in rows up the strings by which the table is suspended.

If we want to give the sparrows a meal without depriving the other birds we can stand our bird table with the cotton fence upon another table, and put food on both. The sparrows will feed all round the cotton fence, but will not venture inside where the other birds are feeding.

LITTLE PROBLEMS FOR CLEVER PEOPLE

THESE problems are continued from page 502, and below are answers to the problems appearing on that page.

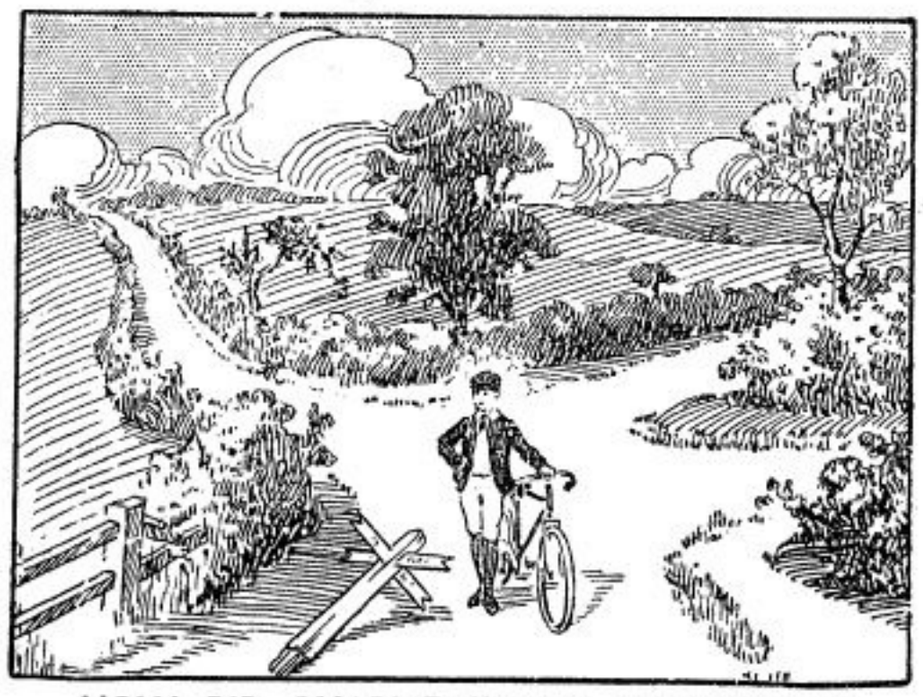
39. Which Farm was the Bigger?

A farmer in Canada boasted that he had a farm of 4 square miles. Another farmer who heard him said: "My farm is bigger than yours. It is 3 miles square."

Was the second farm really the bigger?

40. Which Road did Charlie Take?

Charlie started from his home intending to cycle to a village 10 miles away. He came to cross-roads, and found that the signpost had been pulled up and lay in the middle of the road. Yet he made the signpost tell him which was the proper way to go. How did he do it?



HOW DID CHARLIE KNOW THE WAY?

41. Which is the Heavier?

"Which is the heavier," asked Herbert, "an ounce of gold or an ounce of feathers?" "An ounce of gold, of course," replied his sister Maud. "But a pound of feathers is heavier than a pound of gold," said Herbert. Was he right?

42. How Many Men to Finish the Railway?

A contractor took an order to build 50 miles of railway within one year, and he engaged 225 men upon the work. After 7 months only 21 miles were finished.

How many extra men would he then need to engage to complete the whole line by the time agreed upon?

43. How Far did William Go?

John met his friend William starting out from his house at 5 o'clock. "How far are you going?" said John. "Perhaps you can guess," replied William. "If I walk at the rate of four miles an hour I shall be there five minutes late, but if I walk at five miles an hour I shall arrive at my destination ten minutes too soon."

How far was William going?

44. How Many Rugs were There?

"This is awkward," said the carpet manufacturer to his accountant; "there is an entry for a sale, and many of the figures have been obliterated. It reads:

rugs at £10 cs. 2½d. each—£1,... os. 2½d." "Then we can work it out," said his assistant, and he did. Can you?

45. What was the Cargo?

A ship's cargo was unloaded by 25 barges, each barge taking three loads. But if each barge had been large enough to hold 160 tons more there would have been only one load each.

How big was the ship's cargo?

46. How Many Ducks?

"How many ducks did you drive home?" asked Farmer Bell. "There were two ducks in front of a duck, two ducks behind a duck, and a duck in the middle."

What was the smallest number of ducks Farmer Bell could have had?

THE ANSWERS TO THE PROBLEMS ON PAGE 502

31. The train passed me—that is, travelled its own length—in 9 seconds, and it travelled its own length and 88 yards in 21 seconds. Therefore it went 88 yards in 12 seconds, and, seeing that it travelled its own length in 9 seconds, its length is three-quarters of 88 yards—that is, 66 yards.

32. Ten miles an hour is 1 mile in 6 minutes, so that if the farmer had gone home by the road he took on the outward journey he would have saved 24 minutes instead of 12 minutes. Eight miles an hour is a mile in 7½ minutes, and at 10 miles an hour he therefore saves 1½ minutes in each mile. As the saving in time would have been 24 minutes (which is 16 times 1½ minutes) by the shorter route, it must have been 16 miles. Thus the outward journey was 16 miles long, and the homeward journey was 18 miles.

33. The large sack contained 30 bushels.

34. I would meet 11 trains coming in the opposite direction, not including the one that would be arriving as I started and the one that would be starting as I arrived. There is 24 hours' difference between the starting times of the trains; but as the trains from opposite sides are going toward each other at the same speed, each train will pass another train every 12 hours. Thus, my train will in 6 days pass 12 trains, including the train that will be leaving as I arrive at my destination.

35. It would take 4 hours to walk the 16 miles still to go, but cycling is the quicker way. If James rides 8 miles in 1 hour, and then, leaving the machine, walks right on, he will complete the journey in 3 hours. If John walks for 2 hours he will come to the machine and can ride it the remaining 8 miles in 1 hour, thus arriving at the same time as James.

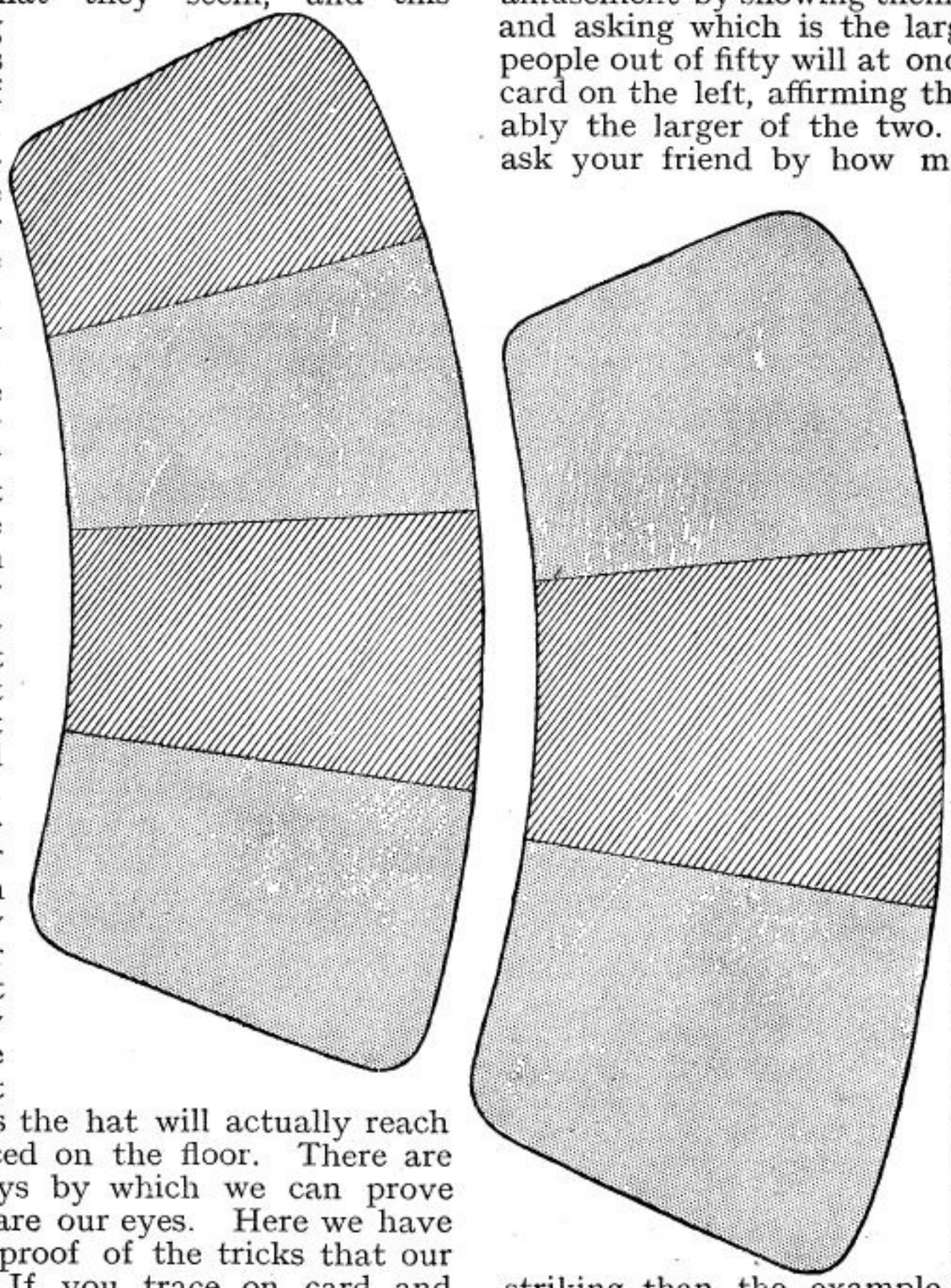
36. The first candle burns for 6 hours and the second for 4 hours. In 2 hours (8-30 to 10.30) the first burns as much as the second burns in 1½ hours (8.30 to 10). Hence, in 6 hours the first burns as much as the second in 4½ hours, so that the second would require one half-hour to burn 1 inch, and it must have been 8 inches long originally, while the first must have been 9 inches long.

37. When his father is three times as old as Harry, the difference between their ages must be twice Harry's age; but the difference between their ages is always 44. Therefore Harry will be 22 when his father is three times as old. Harry, then, will get the pony in ten years.

38. The amount spilt would have served the man who died for 8 days, and this, at 1 quart each day, would have been 8 quarts.

PUZZLING CARDS—WHICH IS THE LARGER?

An old proverb says that things are not always what they seem, and this is something everybody finds out for himself sooner or later. Especially in regard to the size of things our eyes are prone to deceive us, and are particularly untrustworthy when we ask them for details. Ask any friend to point to a spot on the wall of the room or upon the door that would indicate the height that a silk hat would be if it were placed upon the floor. It is almost certain that our friend will touch a spot very much higher than the right spot. Probably he will indicate a point about twice as high as the hat will actually reach when it is placed on the floor. There are many other ways by which we can prove how deceptive are our eyes. Here we have an interesting proof of the tricks that our eyes play us. If you trace on card and then cut out with scissors the two drawings given here, you can derive a good deal of amusement by showing them to your friends, and asking which is the larger. Forty-nine people out of fifty will at once point out the card on the left, affirming that it is considerably the larger of the two. You may then ask your friend by how much it is larger than the smaller one, and he will probably say that it is about one-fourth. or one-fifth larger than the other. As a matter of fact the pieces are the same size. There are two things that assist each other in deceiving our eyes: one is the shape and position of the two pieces side by side, and the other thing is the markings on the two.



There are many devices by which the untrustworthiness of our eyes may be proved, and we can see some of them on another page of this book; but none is more striking than the example of the puzzling cards shown in the pictures on this page.

SITTING DOWN WITHOUT SEATS

If twenty or thirty boys are asked to sit down and there are no seats available, they would probably think that they must sit upon the ground. But it is quite possible for them to sit down without seats, and yet not to rest upon the ground. The picture shows how this can be done.

The boys sit in a circle, and each sits upon the knees of the boy behind him, the last boy's knees forming a seat for the first boy, who in his turn allows the second boy to sit on his knees, and so on. This method of resting for a number of men or boys is not a mere trick or game, but it has been used by French soldiers in Algiers and other parts of Africa over and over again. Where the district is wet or swampy, and it would be unhealthy for the soldiers to sit upon the ground, they are ordered by their officers to rest in this way.

It is not quite so simple as it looks in a picture, but with a little practice any number of boys can sit down. Of course, it is not necessary to have a large number to adopt this clever plan of sitting, and half a dozen can sit upon one another's knees, but not so comfortably as the larger number, as, the circle being smaller, the boys are not so directly in front of one another. This is a good way for children to sit down for a rest at a large party, where it is difficult to find chairs for all.

AN EMBROIDERED TRAY CLOTH

A CREAM linen tray cloth is a useful present, and if it is embroidered with a simple little design in some pretty colour and is edged with lace it becomes a gift that will be doubly acceptable.

To make a little tray cloth like the one in the picture we shall need a piece of cream linen, 18 inches long by 12 inches wide; so if we buy $\frac{3}{8}$ of a yard of linen 36 inches wide it will make two cloths.

Having cut our piece of linen 12 inches by 18, we turn up and tack down a narrow hem $\frac{1}{4}$-inch wide all round on the wrong side. Then hem this very neatly with fine white cotton.

Next, take $1\frac{3}{4}$ yards of narrow filet lace or torchon lace and, beginning at one corner, oversew it on to the edge of the tray cloth. The edge of the cloth should be held just over the straight edge of the lace and tiny stitches are taken (working from right to left) over both the hem and the lace edge at the same time.

Before we begin we should make quite sure that the right side of the lace matches the right side of the cloth.

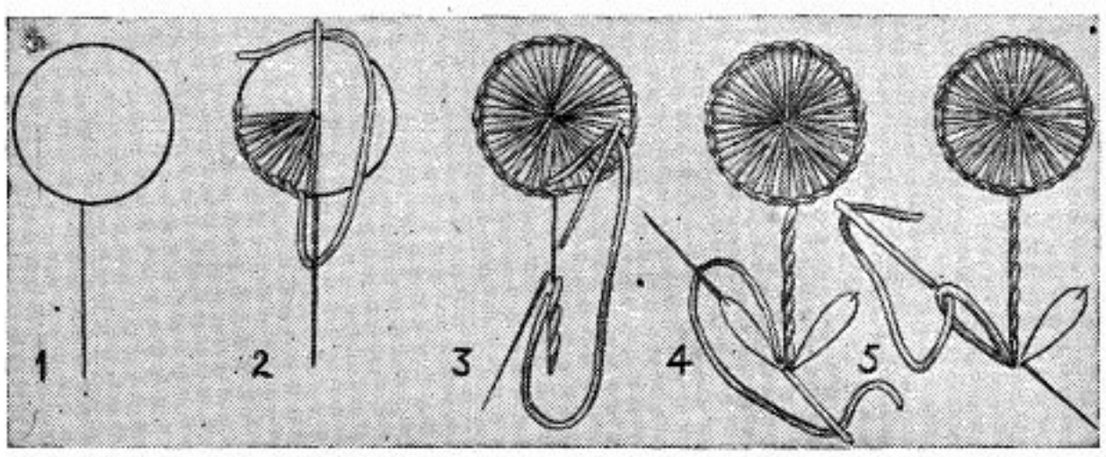
Just before we come to each corner we take some tiny running stitches along the edge of the lace and draw them up so that the lace will fit well and flat round the corner of the cloth. Then we proceed along the next side as before.

When we have finished we press the work on the wrong side over an ironing blanket.

Now comes the embroidery. We shall need one skein of *coton à broder* in sky blue, one of deep blue, and one skein of green.

(If we prefer some other colour, we can still buy one skein of green, but we must buy a light and dark shade of the colour we require as well).

To make the design we want a ruler, pencil, and a sixpence. First of all, embroider a line of stem-stitch right along the sides of the cloth, covering the hemming stitches on the right side. Now take the ruler, and at one corner make a point $\frac{3}{4}$-inch each way from where the lines of stem-stitch meet, using a sharp pencil. Mark another point one inch farther on, and one more point an inch still farther on. We now have six points marked. Measure up $\frac{3}{4}$-inch from each point and with these points (five only, the corner ones meet as one) as their centres, we draw five little circles round a sixpence. Draw a straight line down from the bottom of the circle to the line of stem-stitching (picture 1), but for the corner circle we take this line right into the corner.



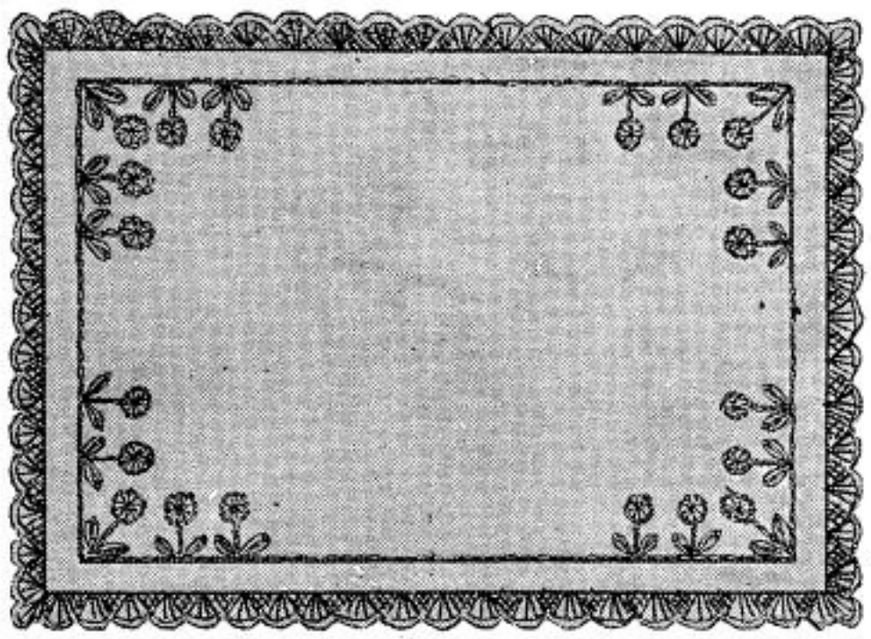
Now, working with deep blue silk, we put the needle in the centre of a circle, and bring it out in an upright position at the edge of the circle. Then, holding the cotton down with the left thumb, so that the needle comes over the cotton, we draw the cotton through (picture 2). We repeat this buttonhole-stitch all round the circle, always putting the needle in the centre and bringing it out a little to the right of the last stitch.

The little stem must be worked next in green stem-stitch (picture 3). To do this we take up a little material with the needle, throw the cotton over to the right, and pull it through. Take up a little more material, bringing out the needle a little to the left above the last stitch, so that the stitches overlap slightly, and continue in this way.

Lastly, draw in a narrow leaf shape, $\frac{1}{2}$-inch long at each side of the flower at the bottom of the stem. On each work a green loop stitch. This is very like a buttonhole-stitch.

Bring the needle up at the end of the stem. Holding the cotton down with the left thumb, we bring the needle out at the tip of the leaf (picture 4). Pull the cotton through, keeping it *under* the point of the needle. Put the needle back just beside it, to hold the loop down and bring it out where the next leaf begins (picture 5).

Now we have a complete little flower. We work them alternately, light and deep blue, and embroider another similar group on the other three corners of the cloth. Finally press the work well on the wrong side, and our cloth is ready for use.



THE CLOTH COMPLETE

This same little design of daisies can be very charmingly introduced along the hem of a little girl's frock. First turn up the hem and hem it with tiny, dainty stitches. Cover these on the right side with a line of stem-stitch and work the daisies as if growing from this line. We can either mix the colours, white and yellow, or white and red, or have them all in one shade.

SIMPLE EXPERIMENTS WITH AIR AND WATER

We can learn a great deal of science from the most familiar objects in our homes, and an interesting half-hour may be spent in performing simple experiments that will teach us much that we ought to know.

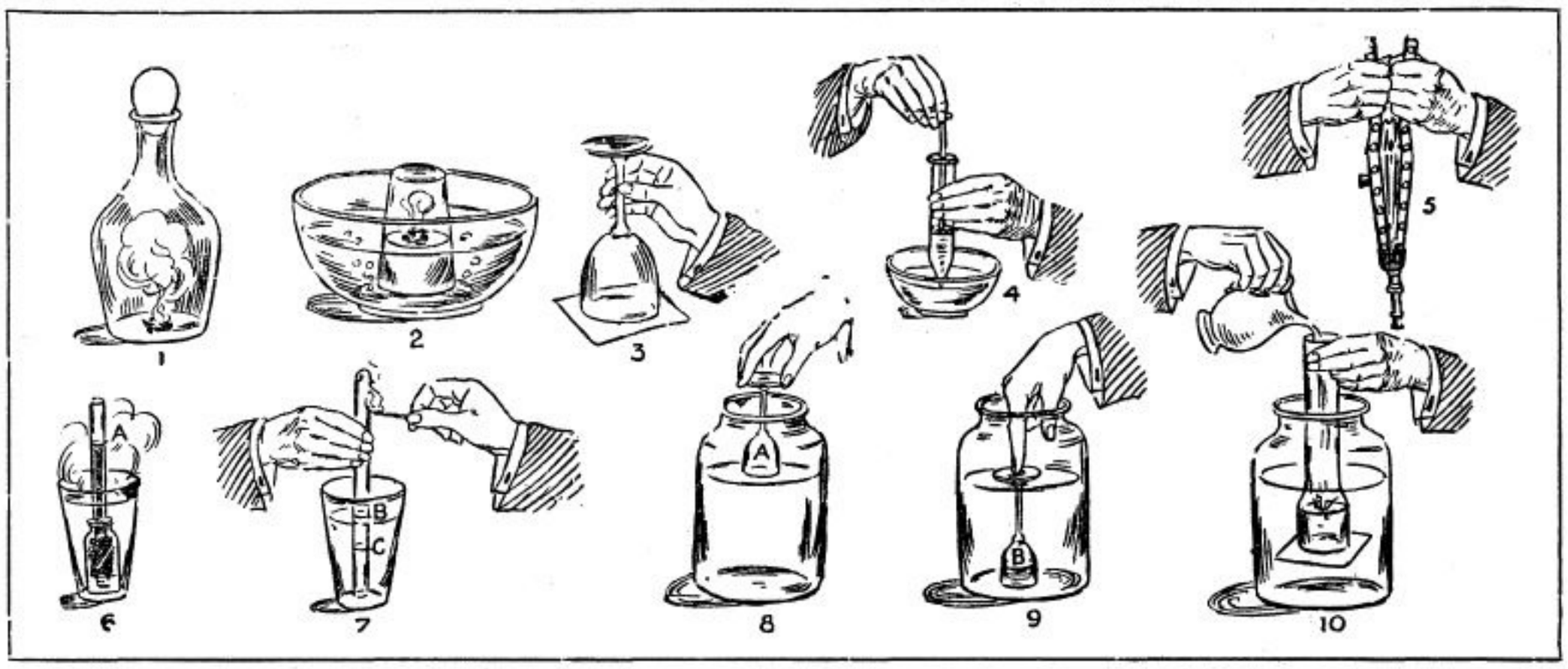
First of all, we can perform an experiment that will show us how the air, which is invisible and does not seem to have any weight, is actually pressing down upon us and upon everything on the earth's surface. We take a wide-necked bottle, such, for example, as the water-bottle in our bedroom; we also prepare a hard-boiled egg to help us in our experiment, carefully removing all the shell.

Now we put into the bottle a piece of lighted paper, and, after a second or two, place the egg in the neck of the bottle as though it were the stopper. The egg will, of course, remain there as if it were in an egg-cup. At least, that is what some of us would expect. But if we watch the hard-boiled egg we shall see, after a time, that it is gradually going down the neck of the bottle as though it were being sucked in. Then, suddenly, it will enter the bottle with a loud noise.

What is the explanation of this? It is very simple. The burning paper heated and expanded the air in the bottle, and some of it was driven out through the opening at the neck. Then the egg was placed in the neck and the opening stopped up. Presently the air in the bottle cooled, and, as it lost its heat, it contracted, or filled less space, so that there was a partial vacuum in the bottle, and the air outside pressing upon the egg drove it into the bottle. The report was caused by the outside air rushing in as soon as the egg dropped and cleared the opening at the neck of the bottle.

There is another simple experiment which shows clearly the pressure of the atmosphere. Take a basin of water, and on the surface of the water let a cork float. Now place on the cork a piece of lighted paper, and over these invert an empty glass, pressing it down gently into the water. Bubbles will be seen to come from under the glass. This is the air being driven out owing to the fact that the heat from the lighted paper has expanded the air, and the glass will not hold it all. A few moments after the water is seen to rise in the tumbler. The cause of this is that when the paper is burnt out the air cools again, and as it does not now fill the glass the pressure of the air on the surface of the water drives it up into the tumbler.

Still another experiment will prove that the air exercises a pressure, not only downward but upward as well. We take a wine-glass, and fill it carefully to the brim with water. Then we take a thin sheet of paper and place it on top so that it touches both the surface of the water and the rim of the glass. Now, holding the paper carefully in position, we turn the glass of water upside down, and the water will remain in the glass apparently suspended. Of course, it is not really suspended, but the air is pressing it up into the glass. The air must not be allowed to get into the glass while we are inverting it, or the water will come out; and as any carelessness will result in an accident it is always wise to perform the experiment over a basin.



EASY EXPERIMENTS THAT CAN BE TRIED IN EVERY HOME

If we want another experiment to prove the downward pressure of the air we can use our basin of water again, and take a small ear-syringe such as is found in every house. We fill it with water, and invert it with the point in the water in the basin. Now we press down the rod and empty the syringe. But directly we pull up the rod again the water rushes up and fills the syringe. The reason of this is that the pressure of the air all over the surface of the water in the basin drives the water up into the syringe.

An interesting experiment, this time with a pair of ordinary domestic bellows, proves that the pressure of the atmosphere is exerted, not only above and below, but sideways and in all directions. Having blown all the air out we completely stop up the nozzle and the vent-hole with corks, and then, if the bellows are in proper order and air-tight, no

boy will be able to open them, no matter in what position they are held. The air outside pressing equally on all sides holds the bellows firmly together.

All bodies, solids, liquids, and gases alike, when heated, expand—that is, they fill more space—and two simple experiments will show this clearly in the case of liquids and gases.

We take a small bottle, fill it with some coloured liquid, such as water in which a little Condy's Fluid has been dropped, and cork it up. But we must see that the cork is pierced, and a piece of glass tube, open at both ends, inserted. Now if we plunge the bottle into a vessel of warm water, as seen in picture 6, the coloured liquid will be seen to rise in the tube to A. This is because the warm water in which the bottle was plunged has heated the liquid in the bottle, and caused it to expand and overflow into the tube.

To show that gases expand we must use a glass tube closed at one end. We take the tube, which is, of course, full of the gas that we call air, and put it into a tumbler of water, as shown in picture 7. The water rises to point B. Now we hold a lighted taper to the upper part of the glass tube, and after a second or two the water descends in the tube from B to C. This is because the heat expanded the air in the tube, and as it wanted more room drove some of the water out.

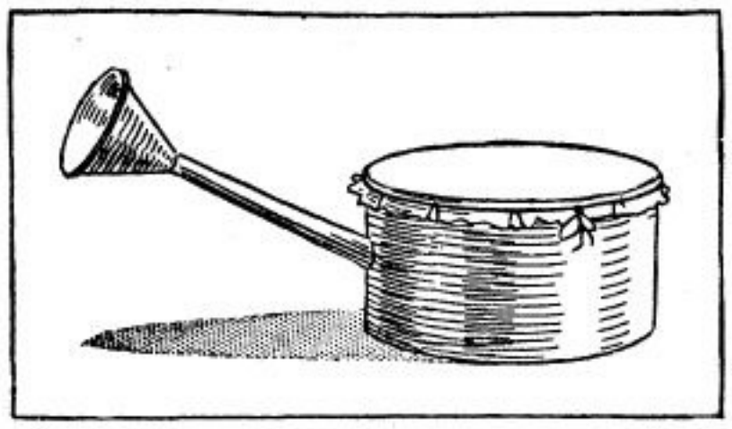
Another experiment with a wine-glass and a jar of water will show that gases, such as the atmosphere, possess the property of compressibility—that is, they can be pressed into smaller space. We take the wine-glass and invert it on the surface of the water. The glass is full of air, which occupies the whole of the space A in picture 8. Now we press the glass down to the bottom of the jar, and we see, as in picture 9, that some water has risen in the glass, and the air that formerly occupied the whole glass now fills only the space B. As we gradually lift the glass out of the jar we see that the air expands and fills the glass as easily as it was compressed.

There is a simple experiment to show that liquids, like gases, exert a pressure equal in all directions. Take an ordinary lamp-glass and place below the widest opening a piece of cardboard. Hold this against it and plunge the whole into a jar of water. Now remove the hand that held the cardboard, and it will be found to remain in position, the upward pressure of the water holding it against the glass. Now pour water gently into the lamp-glass from above; the card continues in position until the water in the glass reaches the level of the water in the jar. The pressure of water top and bottom being then equal the card will be displaced, and sink to the bottom of the jar by its own weight.

A BOX THAT DRAWS VOICE PICTURES

IT is possible to draw beautiful designs with the voice, the designs varying in form according to the strength or pitch of the note that is spoken or sung. Any boy can make a simple instrument that will enable him to draw voice pictures of this kind.

Get a small tin saucepan from an ironmonger's shop. Open the end of the handle, if it is not already open, and make a hole in the saucepan where the handle joins it, so that the handle is really a tube into the saucepan. The ironmonger will do this for us for a small charge. Now take a piece of thin india-rubber, such as toy balloons are made of, and tie this tightly over the top of the saucepan, in the same way that covers are tied on to jampots, taking care that the india-rubber is well stretched. A piece of a bladder or toy balloon does excellently for this purpose. A paper funnel made like a grocer's sugar-bag, with the edge stuck down, should be inserted in the end of the handle, and our eidophone, a name which means "to copy sound," is complete so far as its construction is concerned. The picture shows its appearance.

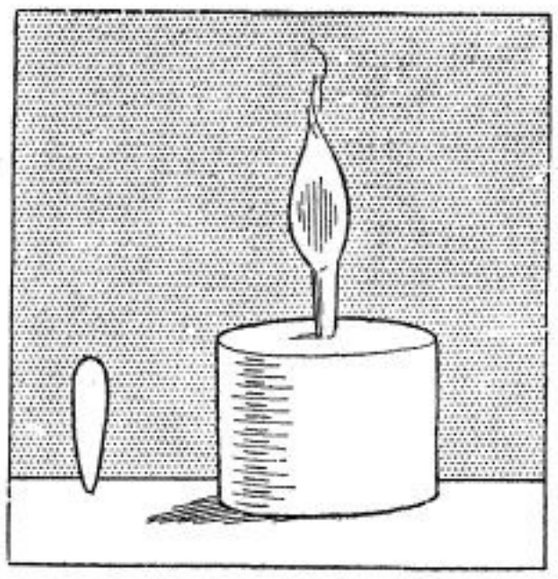


We now have to prepare the surface of the rubber covering so that our voice may be able to draw designs upon it. There are various ways of doing this. We may put a very thin layer of coloured glycerine over the drum, or we may spread the finest sand evenly on the surface. Then, if we sing a note steadily and continuously down the funnel, the sand or glycerine will gradually take a regular form until some beautiful and delicate geometrical design is produced. By practice, of course, we shall learn to sing the notes continuously at suitable pitches, and according to the change in the note so the design will change. Some will come like flowers, some like ferns, and some like trees. If we wish to get even more delicately detailed designs than the fine sand produces, we may try lycopodium powder, a fine yellow powder that is the seed of the plants called lycopodiums. This is to be obtained at the chemist's shop, where we can buy glycerine of various colours. The chemist will colour the glycerine for us according to our order.

In place of the paper funnel we could get a cheap tin funnel, knock the narrow tube off, and have the wide funnel part soldered into the handle. This makes a stronger and more permanent instrument. The whole apparatus will cost only a few pence, and the results that are to be obtained from it are very striking and astonishing.

THE CANDLE THAT CAN BE EATEN

A VERY amusing trick can be performed by any clever boy or girl which will greatly astonish the spectators. We have an accomplice in the audience, and, pretending that we want a light for some other trick, send him to bring us a candle. The candlestick, containing a short stump of candle about an inch high, is duly brought in, and we light it, grumbling at its shortness.



"Why, what is the use of a bit of candle like this?" we ask. "I could quite easily eat a dozen such pieces."

"Well, eat it!" says our accomplice; and without more ado we blow out the light, put the candle in our mouth, and munch it up as if we thoroughly enjoyed it. The surprise of all who are looking on can be imagined. The explanation is that the candle is not really a candle at all. We prepare it beforehand by cutting a piece of apple exactly to the shape and size required, and by sticking into it, in place of a wick, a piece of a brazil nut or an almond. This will light quite readily when we put a burning match to it, and will keep alight for some little time.

We must not prepare the apple too long before it is wanted or it will turn brown, as peeled apples always do, and the trick will be exposed. But if we are careful there is not the slightest reason why any one of the spectators should discover how the trick is done.

MAKING YOUR OWN TOFFEE AT HOME

THE great thing in making sweets is to secure a good, reliable recipe, and to follow it exactly.

It is never worth while to guess at quantities; weigh everything carefully and correctly, and if possible include all the ingredients mentioned in the recipe. Another little hint worth heeding has to do with the quality of the materials used—let them be of the best quality you can obtain.

Toffee may quite well be made over a gas-ring, or on a cooking-range, but if it has to be made over an ordinary open fire it certainly must not be a dull or smoky one, but one with clear red embers.

The saucepan is the next consideration, and it is an important point to see that it is scrupulously clean; besides this, it should be a large one in proportion to the ingredients that are to be put into it, because when boiling, the liquid sweet-stuff sometimes rises very quickly in the saucepan, and it must not be allowed to boil over.

We have our scales and various weights, and to make the toffee we must proceed to weigh these ingredients:

Four ounces of butter. One pound of brown sugar. Mix these well with a tablespoonful of water. Add four ounces of treacle and the strained juice of half a lemon.

It is well to put a little of the butter into the saucepan first, and let all the ingredients melt very slowly.

Great care must be taken to prevent burning, and the toffee must not be left unattended at this stage for a moment. Nothing is better to stir the mixture than a wooden spoon.

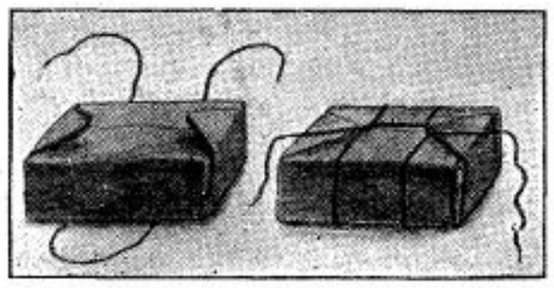
It is almost impossible to tell exactly how long to boil the toffee—about seven minutes—but a reliable test to show that it is well cooked is to drop a small quantity of the liquid into cold water. When it is cooked sufficiently it will become crisp and hard. It may then be taken from the fire.

A large, well-greased dish should be in readiness, and into this the toffee is poured. It must be left for a short while, but before it is cold it must be cut with a knife in small squares, but should not be removed from the dish until considerably harder than it is when this marking may easily be done. Wrap each square in a tiny piece of oiled paper.

It is very necessary to add the caution that great care should be exercised in pouring the hot liquid from the saucepan to the dish, as a burn from this liquid is most painful.

HOW TO TIE UP A BROWN PAPER PARCEL

IT is always useful to be able to tie up a brown paper parcel neatly, and yet there are many who do not know how to do this. We stand the box or article that is to be tied up in the middle of the paper, bringing the two edges together so that they overlap on top of the box, and then neatly turn in the ends so that there is a pointed flap, which is folded up as in the first picture. Then we must tie round the string, which is the most difficult part of the work. The best and easiest way is to fold the string double, and lay it on the table with the box on top of it, as in the first picture. We then slip the two loose ends of the string through the loop, draw this loop up on top of the box, and turn the ends to right and left, as in the second picture; now take them round and tie on the other side. A little practice in following these simple directions will make us quite expert packers of neat, business-like parcels.



THINGS DIFFICULT TO SAY

We all know the curious sentence with many saws in it that we were asked to say when we first went to school : Of all the saws that ever I saw I never saw a saw to saw like this saw was to saw. That is quite easy to say, but there are many sentences with the same word or syllable or sound that are hard to say, especially to repeat several times in quick succession, and they have been aptly called tongue-twisters. "Truly rural" seems quite a simple expression, and yet there are very few people who can say it quickly several times running without twisting it into something that sounds like toorelooral.

One of the most familiar of these tongue-twisters is the verse :

Peter Piper picked a peck of pepper ;
Did Peter Piper pick a peck of pepper ?
If Peter Piper picked a peck of pepper,
Where's the peck of pepper Peter Piper picked ?

Here is another tongue-twister in the form of a verse :

Oliver Oglethorpe ogled an owl and oyster ;
Did Oliver Oglethorpe ogle an owl and oyster?
If Oliver Oglethorpe ogled an owl and oyster,
Where are the owl and oyster Oliver Oglethorpe ogled ?

Perhaps even more difficult to repeat than either of these is a verse in which the sound of q occurs in almost every word.

Quixote Quicksight quizzed a queerish quidbox ;
Did Quixote Quicksight quiz a queerish quidbox ?
If Quixote Quicksight quizzed a queerish quidbox,
Where's the queerish quidbox Quixote Quicksight quizzed ?

The sound of c, too, mixed up with the sound of cr, is difficult to repeat over and over again in a sentence. Here is a sentence combining these sounds :

Captain Crackskull cracked a catchpoll's cockscomb ;
Did Captain Crackskull crack a catchpoll's cockscomb ?
If Captain Crackskull cracked a catchpoll's cockscomb,
Where's the catchpoll's cockscomb Captain Crackskull cracked ?

Two or three other tongue-twisters, all of them rhymes, may be given here :

Betty Botta bought some butter.
"But," she said, "this butter's bitter,
But a bit of better butter
Will but make my butter better."
So she bought a bit of butter,
Better than the bitter butter,
And it made her butter better.
So 'twas better Betty Botta
Bought a bit of better butter.

Here is a prose tongue-twister which should be repeated very rapidly :

How much wood would a woodchuck chuck if a woodchuck could chuck wood ? If a woodchuck could chuck wood, the wood that a woodchuck would chuck is the wood that a woodchuck could chuck, if the woodchuck that could chuck wood would chuck, or a woodchuck could chuck wood.

A very good tongue-twister is the verse about the sea-shells :

She sells sea-shells on the sea-shore ;
The shells she sells are sea-shells I'm sure.
So if she sells sea-shells on the sea-shore
Then I'm sure she sells sea-shore shells.

Here is a series of sentences that Dr. Moberly, headmaster of Winchester School, and afterwards Bishop of Salisbury, used to make his boys read, placing the emphasis on the right words. They are all perfectly correct, but take a good deal of examination before the sense can be understood in each case :

I saw that C saw.
C saw that that I saw.
I saw that that that C saw was so.
C saw that, that that that I saw was so.
I saw that, that that that that C saw was so.
C saw that that, that that that that I saw was so.
I saw that that, that that that that C saw was so.

Repeat this twister six times in quick succession without mixing up the words in any way :

Six sieves of sifted thistles,
Six sieves of unsifted thistles,
And six thistle sifters.

It is very amusing to try to repeat this :

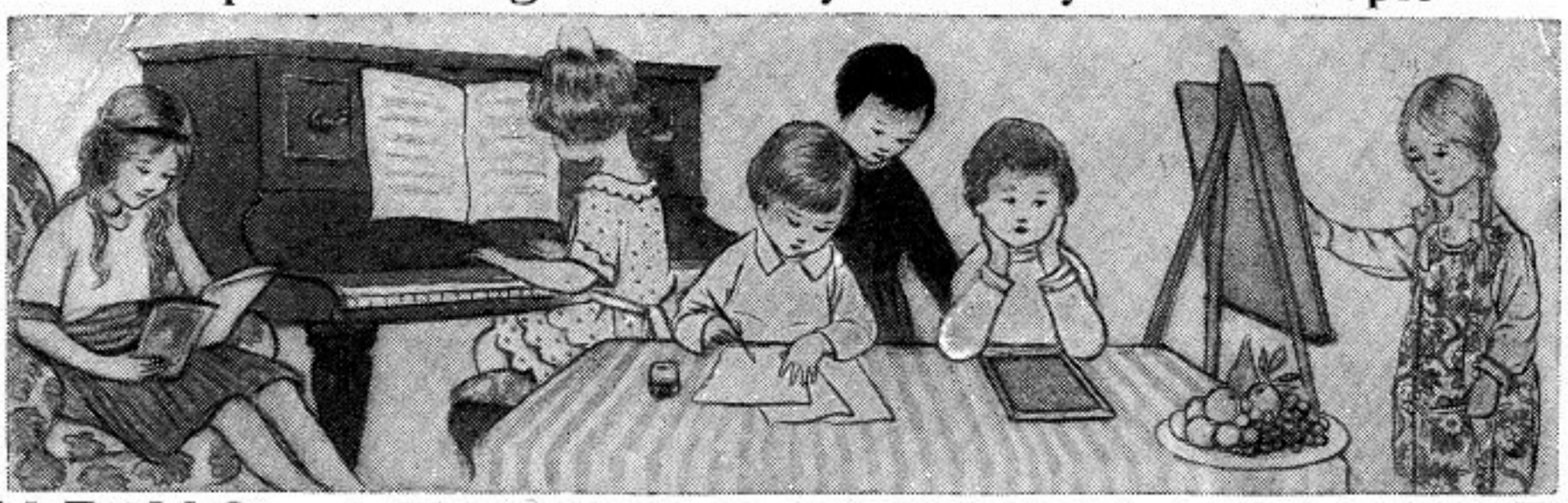
Mrs. Biggar had a baby. Which was the bigger ? The baby was a little Biggar ! Which was the bigger, Mrs. Biggar or the baby ? Mr. Biggar was father Biggar ! Mr. Biggar died ; was the baby then bigger than Mrs. Biggar ? No, for the baby was fatherless !

There are many variations and elaborations of "the saw that sawed wood." This one is very difficult to repeat quickly :

Esau Wood sawed wood. Esau Wood would saw wood ! Oh the wood Wood would saw ! One day Esau Wood saw a saw saw wood as no other wood-saw Wood saw would saw wood. In fact, of all the wood-saws Wood ever saw saw wood Wood never saw a wood-saw that would saw wood as the wood-saw Wood saw saw wood would saw wood ; and I never saw a wood-saw that would saw as the wood-saw Wood saw would saw until I saw Esau Wood saw wood with the wood-saw that Wood saw saw wood.

SCHOOL LESSONS

Simple Learning Made Easy for Very Little People



READING—LEARNING FIGURES AND SHAPES

BILLY and Betty had good fun playing with their pink and blue cards, and when they knew all the words they did a few easy "shapes," but very easy ones.

Mother had thought out a way to learn the names of the colours and numbers and shapes. She said one day : Here is some nice squared paper. The squares are large, an inch wide, so that they will not hurt your eyes. Now take your crayons and fill in a square inch in every colour you have ; use ink for black ; and I will tell you how to print the name of the colour underneath.

So the twins coloured in their squares and the word underneath.

Then when they had learned quite a lot of words with their pictures, Mother said : You know there are a lot of words that have no picture, but they have to be learned just the same, and we can learn them in the way we learned our ABC. We can learn them through our nurseryrhymes

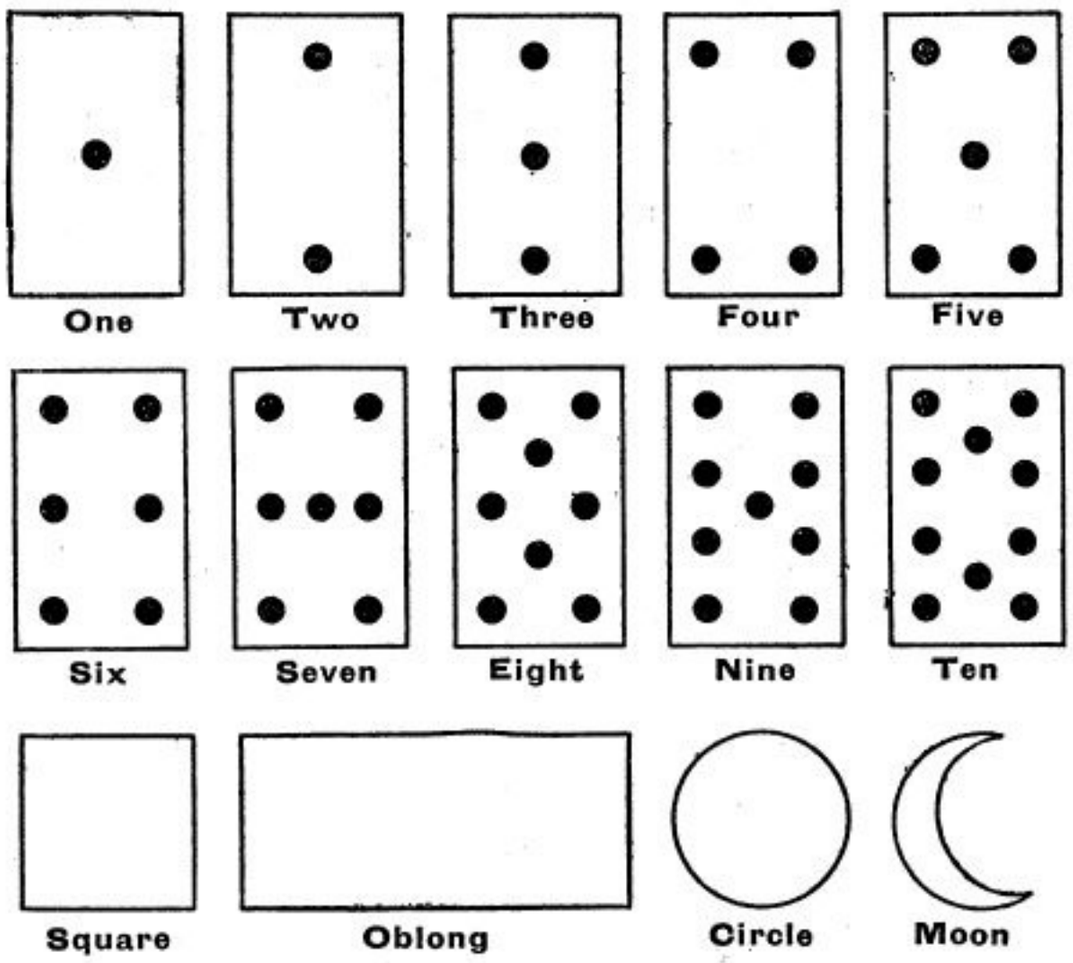
Betty said they could read Jack and Jill and the others out of the book Auntie gave them.

Ah, but you can only read them straight through, you see, Mother said. You can't read the words when they are all mixed up, can you? The picture only tells you the whole rhyme, not what each word is. So let us learn them in our A B C way.

Here is a large envelope full of loose printed words. We bought it at the toyshop. Outside on the envelope is a picture of Jack and Jill went up the hill and the words are *joined*. The loose words inside are the same. Now lay out your loose words, copying from the long line.

Jack and Jill went up the hill
Jack | and | Jill | went | up | the | hill

Now mix them all up again, and pick up any one you like, and learn it by singing along until you match it in the same way as you did before.



Billy and Betty did a lot of the rhymes like this, both in their reading and writing lessons, till they learned words like and, went, up, and the Then Mother said they could put their books away. Next time they were going to learn something new

WRITING—LETTERS OF THE SAME SIZE

By the time that Billy and Betty had learned all their letters and listened to all the little stories about their shapes and their different sounds, Mother said they were beginning to get on quite nicely.

At first they liked doing the letters one by one, large and small, all in rows, and after they had done a row of letters all alike Mother would let them run their finger all along and point to each one and make its sound.

This was good fun for a little while; but sounds by themselves and without any " doing " are not good fun for very long, because they do not mean anything by themselves. So one day Mother said, Now let us see if we can do a row of different letters all jumbled together. That will not be so easy. Tell me why?

Because some of the letters are long and some are short, said Betty.

Yes, said Billy, and some go up and some go down.

Quite right, said Mother. Let us first choose them in rows of letters nearly alike.

First we will do only letters that do not go up and down; but, remember, they must all be the same size as each other, though they won't be all the same shape.

Let me choose some little words with letters with no tops or tails. They will give us the names of things we all have, and do not want to lose, and we carry them with us wherever we go.

The twins watched Mummy write, very carefully, these words :

nose, ears

Then they tried to copy them. But Billy's and Betty's lines ran all over the place.

Oh, dear! said Mother. Why, your writing is all hills!

Well, Mother, why can't we have two lines to write in, then the top would be as straight as the bottom, said Billy.

Ah, but you see, said Mother, we mustn't have so much to help us; and too many lines are bad for your eyes. Besides, by and by you will be asking me to let you have two more lines for the tops and tails. No. Listen! You must just *think* that top line. Think you can see it there when you write.

So they tried very hard and did the words over again, and did them quite nicely.

Next day, when Billy and Betty, and the table, and the boards, and the chalks, and the dusters, and the sponges were all ready, Mother gave the twins a parcel, and said : I have a nice little surprise packet for you today. Open it and see what you will find.

They opened it and found some pretty coloured tickets, each with a little word and a little picture.

Now, said Mother, you can write these words and draw the little pictures. They are all easy to draw.

These are some of them :

Man

Can

Sun

Mouse

Worm

Rain

Cow

Sow

See-Saw

Now let us try to do those letters that have tops, said Mother. They will be twice as high as the short letters, and the easiest are the capitals which are always just as high as each other.

So they did their old friends A B C right to Z, line by line, as they put them in their reading.

COUNTING—SIX NEW NUMBERS

Now let us have a little talk on Number 5, said Mother, and I think you will like this number, because everybody carries about some nice fives with them wherever they go. Billy and Betty, Daddy and Mummy, and Baby and Jenny, we all carry about with us little servants, all in fives.

Our fingers and toes, cried the twins.

Yes, of course, said Mother ; and she sang to them, This little pig went to market.

Can you think of any other nice fives ? said Mother. Let me draw some, five fingers, five toes, five petals.

These are always five, but we can draw many fives.

Oh, yes, said Billy, and we can only write five words on a postcard for a halfpenny stamp.

And there are five lines in Mother's music, said Betty.

Yes, and Mother told us that nice story of five peas in a pod, said Billy.

And we are five years old, said Betty. Five is a nice number, as Mother said.

There is a great deal more to learn about 5 and the other numbers, said Mother, but it is nice to love them first and then we *want* to learn more about them.

Now we will talk about Number 6, said Mother. What can you tell me about 6 ?

Why, of course, said the twins, those six little new pennies Grannie gave us on our birthday and the nice little silver sixpence Auntie gave us. And then there was the story about the crooked man who found a crooked sixpence.

Yes, said Betty, and there is that little song about : Six little mice sat down to spin.

Think again, said Mother. How many people live in this house ?

Why, 6. Daddy and Mummy, and we two, and Baby and Jenny.

And what about 6 o'clock ? said Mother.

But the twins never liked that six because it was bedtime !

And what about 7 ? asked Mother.

Well, we like 7 o'clock in the morning because then we can get up, said Billy.

And there are 7 days in the week, aren't there ? said Mother. Let us say them through.

SUN-DAY MON-DAY
TUES-DAY WEDNES-DAY
THURS-DAY FRI-DAY
SATUR-DAY

By and by you will learn a little song about a little girl who said, We are Seven.

Ah, but, Mother, said Betty, we forgot. We ought to say we are Seven in our house, because we must count in Fido !

So we must, said Mother.

And then, said Billy, there is that guessing story you told us about.

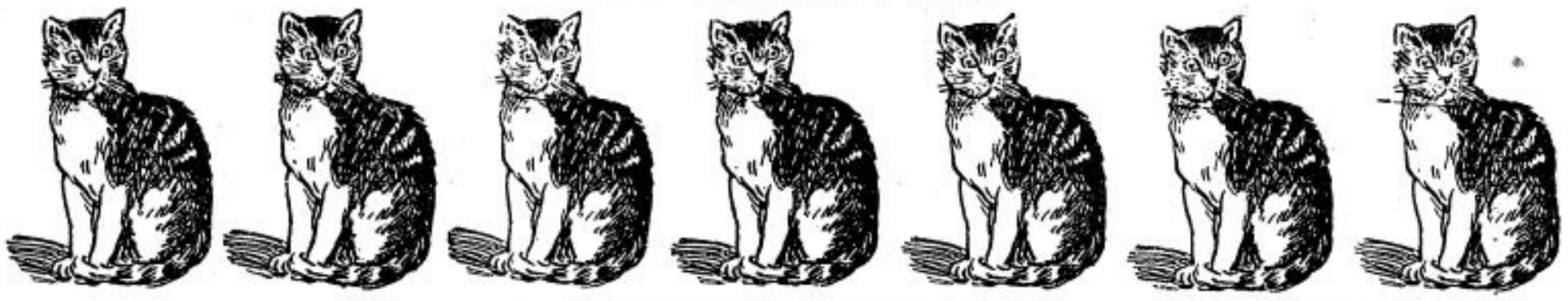
As I was going to St. Ives
I met a man with 7 wives
Every wife had 7 sacks
Every sack had 7 cats
Every cat had 7 kits

The twins knew a lot about 9 because Uncle Ted had brought them a box of nine-pins—those nice jolly ones like Aunt Sallies.

They loved to knock down the pins and see how many were left; so they soon learnt Number 9.

I MET A MAN WITH 7 WIVES

EVERY WIFE HAD 7 SACKS



EVERY SACK HAD 7 CATS

EVERY CAT HAD 7 KITS

Then they talked about 8, 9 & 10.

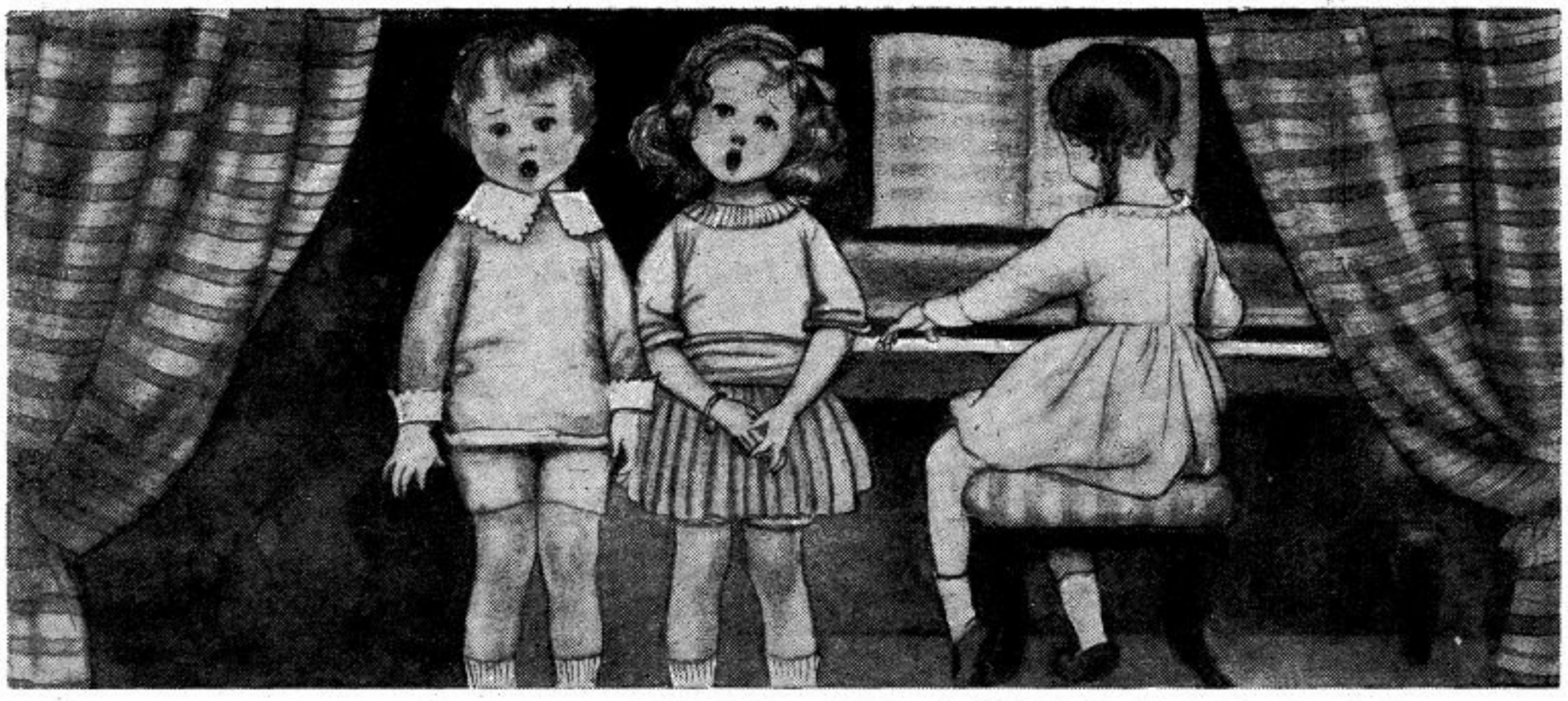
Betty and Billy always liked 8 o'clock because that was when the postman came and they ran to the front door to pick up the letters.

We need not talk much about 8, said Mother, because you have your boxes of 8 cubes and 8 bricks.

The twins were very fond of these little boxes, though they had a box of bigger bricks as well.

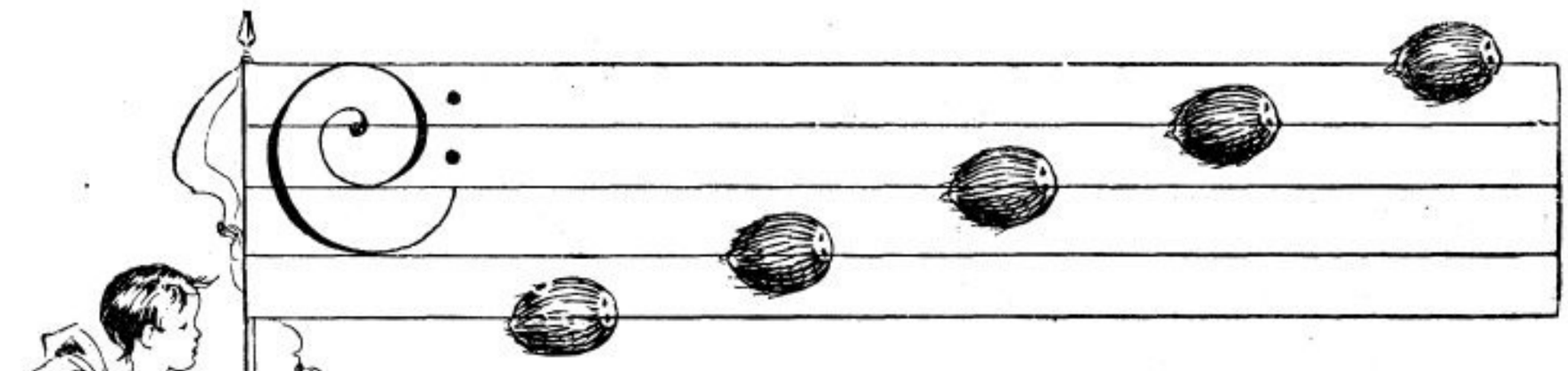
Quite the best way to love Number 10 is to sing the old baby song, Ten little fingers, ten little toes; and perhaps we shall find some more number songs like Ten Little Nigger Boys:

Ten little nigger boys going out to dine,
One choked his little self—then there were 9.
Nine little nigger boys crying at their fate,
One cried himself away—then there were 8.
Eight little nigger boys travelling in Devon,
One said he'd stop there—then there were 7



MUSIC—THE MEETING ON THE BASS ROAD

MAKE way! Make way! Make way! cries little Bass Clef, for his road is to be the scene of a fairy meeting today, and he has been up and about



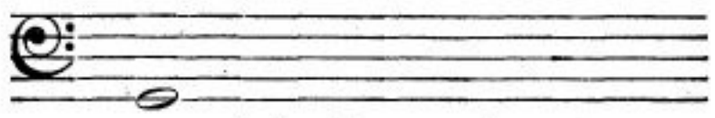
since early morn to see that nothing is wrong with the motor-lines, and to be ready to tell you and me what is happening. Treble Clef has told him what a success her fairy procession was, and he is quite determined that the Bass Road Meeting shall succeed just as well. Here is an illustration of the two roads to show you how very close they are together. In fact, it is like one long road, half of it bearing one name and half of it bearing another, while Fairy C's middle house is situated in the very centre.

Fairy C

The fairy motor-cars are still standing in their proper places in the Treble Road, so little Treble Clef is still on duty, and Bass Clef has now taken up his position at the entrance of his road, to tell us what the fairies are doing down there.

These little people have many games of which they are very fond, and they have many different ways of carrying out their various plans; sometimes they will tell their little guides, but at other times they just take them by surprise.

Today Bass Clef has to wait very patiently. There are the motor-lines, there stands our little guide, but, so far, all is silent. Suddenly he sees what looks like a coconut on the first motor-line.



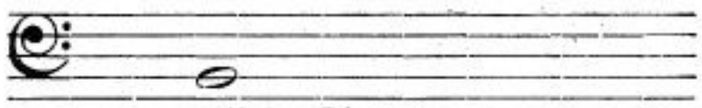
Fairy G's coconut

As quickly as possible he beckons to you and me to run to the piano and call on Fairy C in her middle house. We press the panel of her door, and find her quite ready to help us. She says we are to pass by the nine little white doors lying to the left of this particular house of hers, and when we come to the tenth we are to press it very firmly and we shall hear something we want to know. Press it down and listen. This time we hear a deep voice, for there is something about

this road that makes fairy and goblin voices very deep indeed.

On line number one you surely can see
A coconut dark—it holds Fairy G.

Yes, Fairy G has come first, and has told little Bass Clef that today she and her friends are arriving in coconuts. Fairies like to have ways of their own, and they know it will be a surprise to you and me, because, somehow or other, we have never tried to ride in a coconut, have we ? But while you and I have been talking the fairies have not been wasting their time. Look ! Another coconut has made its appearance.

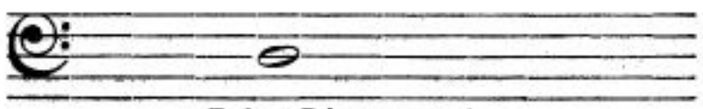


Fairy B's coconut

You must go to the piano again, whispers Bass Clef, and this time press the door which is next but one to the right of Fairy G, who has just been singing to you. Again we listen, and this time we hear Fairy B's voice.

Coconut does what I want her to do,
It shows you B's home on line number two.

Yes, for some reason or other the fairies have made up their minds to be very mysterious today, and even Bass Clef cannot foretell their coming. For one minute there is nothing to be seen ; the next moment another coconut, the fairy's strange carriage, is on its line.

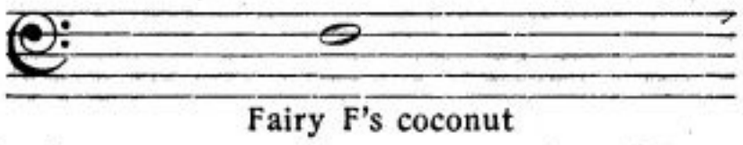


Fairy D's coconut

See ! Here is a third one, and Bass Clef has just said we must go to the next door but one to the right of the house we have just visited, and if we press it gently we shall hear Fairy D's voice. This is her little song.

Coconut dear, your friend Fairy D
Very much wants the line number three.

Hardly has she sung this little rhyme when we find a fourth coconut has arrived.

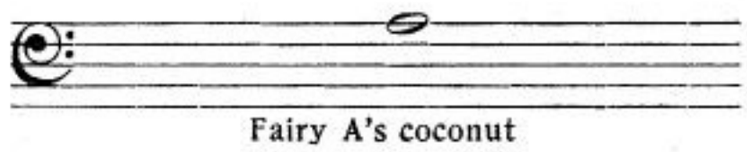


Fairy F's coconut

Again we must hasten to the piano and call at the next door but one to the right of Fairy D, pressing it just as we have pressed the other doors. We hear Fairy F's low voice.

On line number four I'm waiting today,
'Tis Fairy F's voice, what more need she say ?

The fifth coconut ! whispers Bass Clef, who is quite astonished at the new game of the fairies.



Fairy A's coconut

However, sure enough, here is the fifth coconut, and inside it dwells a fairy. Once more we must run to the piano to find out all about it. Bass Clef says we must go to the next door but one to the right of the house where we have just heard Fairy F's voice. Press the door very gently and listen. Fairies never keep us long, and this time it is Fairy A who sings to us.

Fairy A's nut could not roll very fast,
But line number five is now reached at last.

What a funny day we have had ! says our friend Bass Clef, and you and I think so too, and to make it funnier still the fairies have been making up a rhyme while sitting in their coconuts in the Bass Road, and here it is for you and me to read.

The first line, children, as you see,
Was taken by the Fairy G ;
When B came up the second line,
The third, said Fairy D, is mine.
The fourth was Fairy F's ; and last
The fairy A went singing past.
My line's the fifth, she sang, so I'm
Not really late, but just in time.

This time we have two little puzzles, and we will see how quickly we can find them out.

You see, the fairies in both roads are having a game of play. They want us to find out their names very quickly, and directly we discover each fairy we must go to her home on the piano, wherever it is, and press down the note. Then she will sing to us.

DRAWING—HOW TO DRAW STRAIGHT LINES

In another part of this book we learned how to draw an envelope; now we are going to draw a square. A square has four straight lines, all of the same length.

We shall want a sheet of white paper, a B pencil, a piece of soft indiarubber, a flat ruler with inches marked on it, some red chalk, or a paint-box with brushes and water.

Fasten the paper to the board, and have your pencil sharpened with a chisel-point.

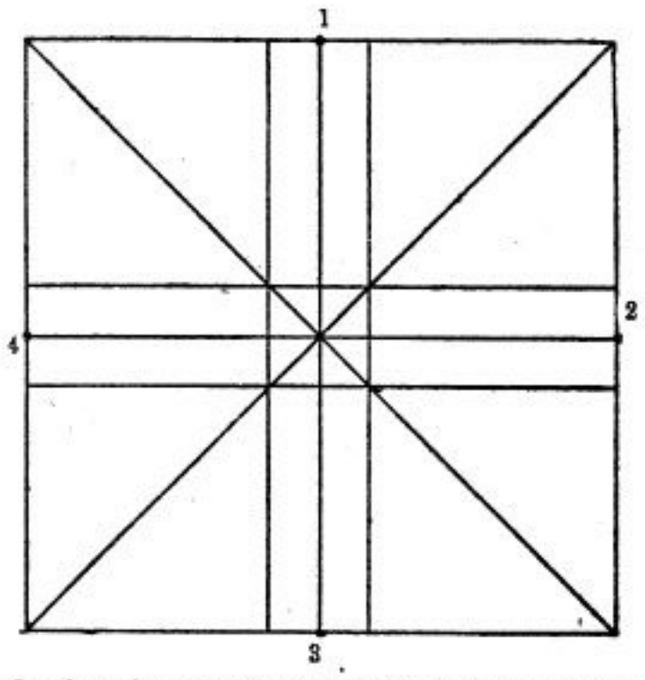
Now look at your ruler, which is marked 1, 2, 3, and so on. Each of these divisions is one inch. Put the ruler away, and see if you can make a little line from memory exactly an inch long. Get the ruler again, and see if your line is the right length.

Now look well and see how long the ruler is from one end to figure six—that is, six inches. Put the ruler away again, and see if you can draw, from memory, a line six inches long, then measure with the ruler to see if it is right and make it a little longer if it is too short, or rub out what is not wanted.

Try to draw a square—that is, three more lines, all the same length, six inches long, and all joining at the corners. Hold your pencil well down, away from the point, and use the side of the point—not the tip.

Take the ruler again and place it against each line—without ruling a fresh line—to see whether yours are very crooked. If they are try to alter them, but if they are very wrong it is better to draw a fresh square. If you rub paper too much it spoils the surface, and the drawing looks untidy; besides, the pencil will not work properly after indiarubber has been used too much, and one cannot paint on dirty, rough paper.

When we have a good square we must draw lines from corner to corner, crossing at the centre; then draw lines from side to side, both ways, also crossing at the centre, where the other lines crossed. It is a good plan to put dots on the sides immediately opposite the centre before you draw the lines from side to side.



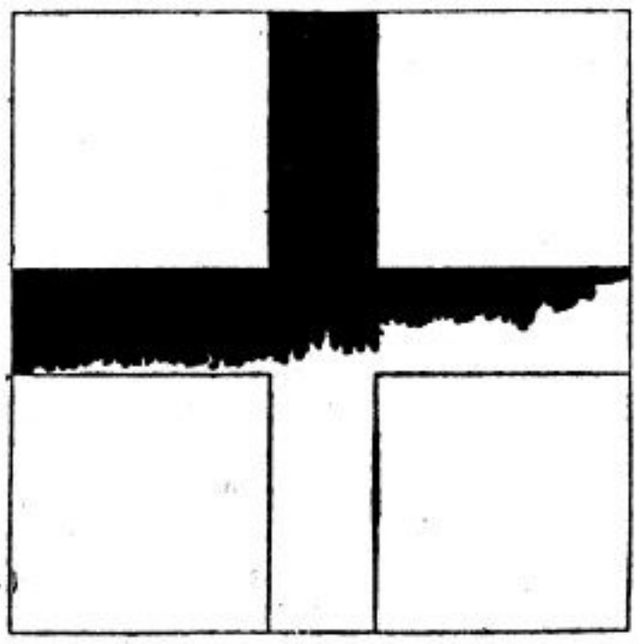
In drawing the Cross of St. George be sure that the lines are all straight and "true"

Now draw lines on each side of the lines, downward and across the square from side to side—not the lines from corner to corner—as you see in the picture. You will have a cross now in the middle of the square, and if the lines are straight we can paint this cross bright red, like the cross of St. George of England and the cross which the Army nurses wear as a badge. Perhaps you have seen it painted on ambulance waggons.

Rub out all the other lines before you begin to paint. Rub very lightly, or you will rub the surface of the paper away, and then the paint will sink in and look blurred and untidy instead of lying smooth and even.

If you have rubbed out a good deal in trying to make it right do not try to paint it at all, but draw a better one. Make this a general rule; do not rub out but try again. Use plenty of wet colour, unless you prefer to use red chalk.

When we have finished this, we should try to draw another shaped cross in another square, and paint it a different colour. If we look at the Union Jack we shall find it; it is called the cross of St. Andrew, and he is the Scottish saint.

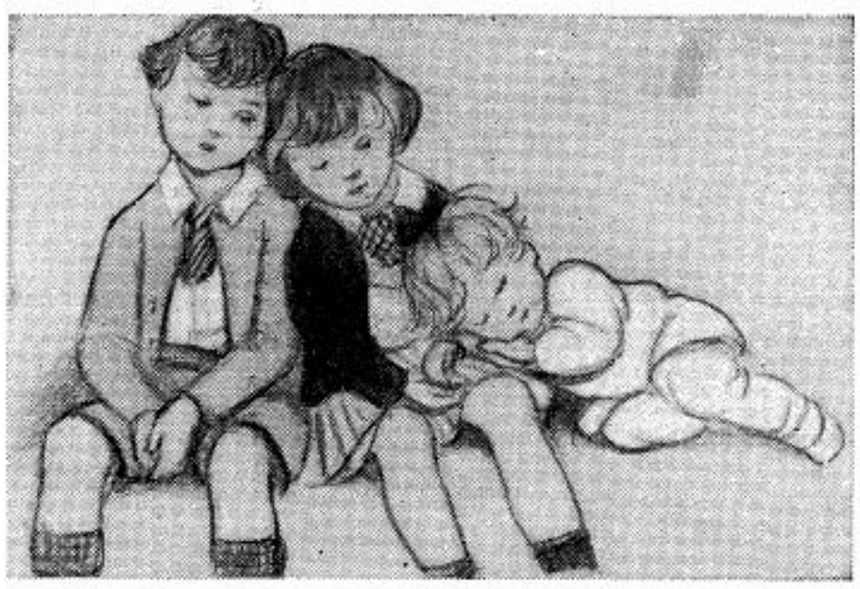

To paint the cross, begin at the top, using plenty of wet colour, and paint downward

There is an Irish saint, too, called St Patrick, and he has a cross of his own. When we have done these we can get more practice in straight lines and colouring by drawing and painting some of the flags of other countries, which will help us to draw our lines straight and will teach us the different flags. Some of these have very bright, pretty colours.

We must also remember how to put on a flat wash. We shall not find this difficult, because we have learned all about it.

FRENCH—IN SIGHT OF THE SEA

HERE we read of the arrival of the travellers at Dover. We must be sure to remember that the first line under the picture is the French; the second line gives the English word for the French word above it; the third line shows how we make up the words in our own language.



Nous sommes fatigués de jouer
We are tired of to play
We are tired of playing

Bébé dit qu'il a faim
Baby says that he has hunger
Baby says he is hungry

Nous avons tous faim
We have all hunger
We are all hungry

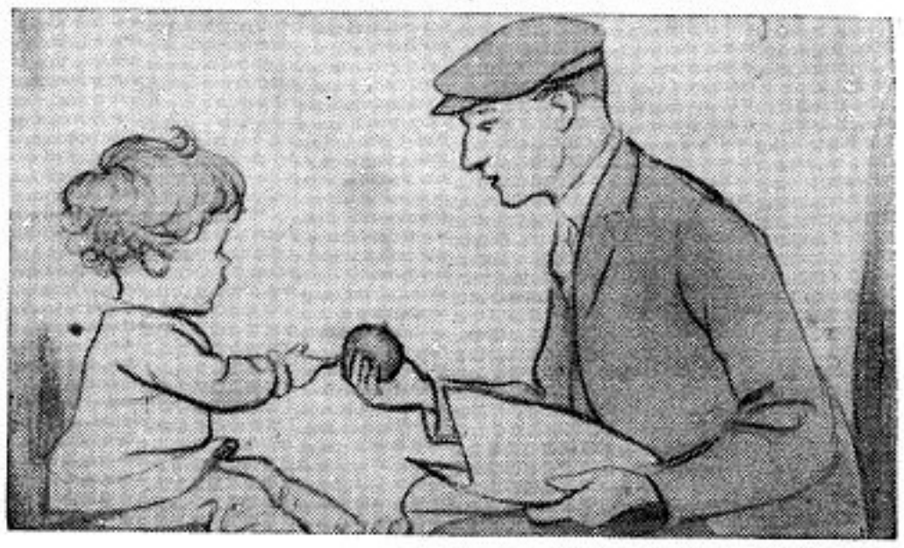
Maman nous donne des pommes
Mamma us gives some apples
Mamma gives us some apples

Toutes les pommes sont rouges
All the apples are red
All the apples are red

Bébé laisse tomber la sienne
Baby lets to fall his
Baby lets his fall

Il recommence à pleurer
He begins again to cry
He begins to cry again

Papa se baisse pour la chercher
Papa himself stoops in order it to find
Papa stoops to find it



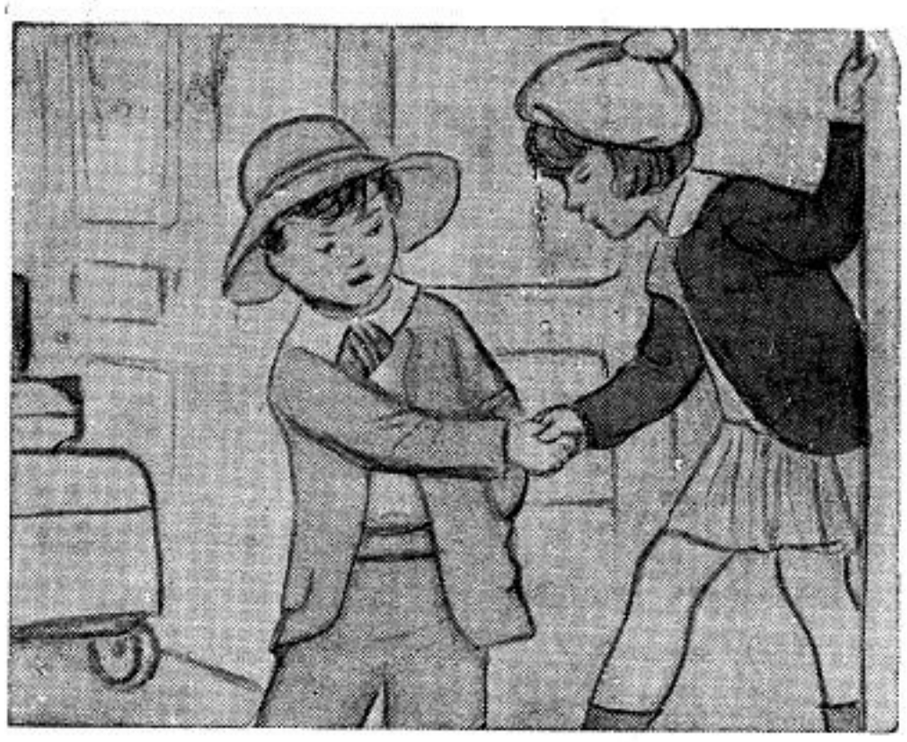
Papa donne la pomme à bébé
Papa gives the apple to baby
Papa gives the apple to baby

Le train s'arrête
The train itself stops
The train stops

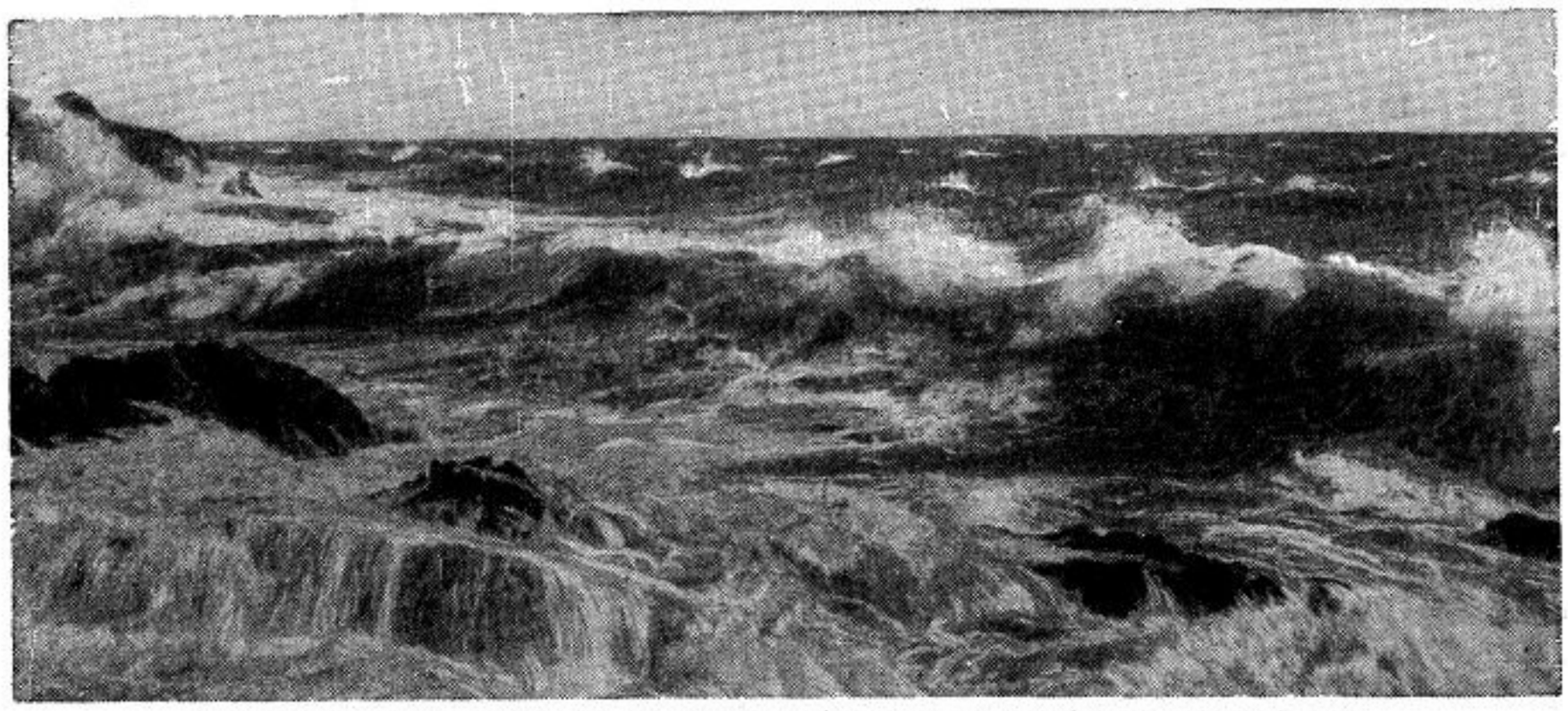
Papa perd ses lunettes
Papa loses his spectacles
Papa loses his spectacles

Maman les ramasse
Mamma them picks up
Mamma picks them up

Nous sommes à Douvres
We are at Dover
We are at Dover



Nous descendons du train
We get down from the train
We get out of the train



The waves of the ocean that have played their part in the shaping of the Earth

HOW SUN AND WIND MADE THE HILLS

Most of the wonderful things that happen in the world depend on things working together, and nothing is more interesting than to discover and study the working of the great and little partnerships in Nature.

Probably the most powerful and most important partnership ever formed was the partnership between Sun and wind to make mud. Both are mighty workers, never idling and never resting: they have factories all over the world, and their production is, and has been, stupendous beyond imagining.

When the Earth was first formed its surface, as we have seen, was merely a veneer of slag some thirty or forty or fifty miles thick, and it probably would have remained simply a crumpled crust of grey and green and black slag, covered here and there with water, if the Sun and the wind had not put their heads together and started to make mud-pies.

The Sun toiled ceaselessly to lift water to tremendous heights in the sky, where it formed clouds, and the wind carried the clouds about, and made them fall in rain, mostly on the top of hills, the rain collected into streams and rivers, and the streams and rivers broke up the basalt and granite into mud, until the whole Earth was nothing but a big mud-pie.

The Moon seems to do pretty hard work when it lifts the tides—sometimes forty feet high—and some pumping machines can raise many tons of water a day; but such work is child's play compared with the work done by the Sun. The clouds seem light, but they contain enormous quantities of water, and the total weight of water raised by the Sun during the year must be millions of millions of tons, for it is enough to keep the Amazon and the Nile and the Mississippi going, not to speak of Niagara and the Victoria Falls, and a thousand other rivers. It is calculated that the rain which falls yearly upon England and Wales alone weighs nearly 70,000 million tons, and every drop of it is lifted by the Sun!

Indeed, the work the rivers do is really the work that has been done by the Sun and the wind; all the rivers themselves do is to let themselves fall into the sea.

Yet, as they fall, they wear away the hard rocks of their beds, and ages ago they wore down into mud all the granite and basalt surface of our planet.

The wind, of course, does a great deal to assist the Sun in the mud-making. It lifts the clouds higher and carries them about, and, with the help of the Moon, it hurls the waves on the coasts of the world and gradually breaks them down. Also it

blows about sand, and wears down rocks as with a sand blast. The carbon dioxide is also of assistance, for it is dissolved in the rain-water, and acts chemically on lime and marble, and other materials in the crust. Frost and ice, too, are rock-grinders, rock-breakers, and mud-makers. But the Sun is the most strenuous worker in the great mud firm, and most of the mud in the world is due to his strong arm.

If we look at the rivers nowadays we get some idea of what they, with the sun-lift in them, are able to do to turn the dry land into mud.

ENOUGH SALT IN THE SEA TO COVER DRY LAND AS DEEP AS ST. PAUL'S

Consider the salt in the sea, practically all of which they collected! How much salt is there in the sea? It is estimated that the sea contains 144 billion tons of it—enough to cover the whole dry land 400 feet deep; that is to say, to cover the Earth with salt higher than the cross on St. Paul's. That is surprising, but more surprising still are the estimates of the mud carried yearly into the sea by great rivers. The Mississippi carries more than 400 million tons of sediment yearly into the sea—enough mud to cover a square mile 68 feet deep; while the Yellow River of China brings down every year more than twice as much. Altogether the rivers of the world must make a big mountain of mud every year. Egypt is made of Nile mud, and the Netherlands chiefly of mud of the Rhine.

That is how the world has been sculptured and **planned.** The peak of the Matterhorn, the great limestone masses of the Dolomites, the vast canyons in Colorado, the great sierras of the Andes, were all shaped by the wet fingers of the Sun.

With a cloud the Sun made the magic clay that was to grow into roses and wheat and men. With clouds the Sun rubbed away the dry, hard, slaggy crust of the Earth and turned it into soil and food and living things.

THE GREAT MOUNTAINS THAT ARE WASHED INTO THE SEA

But this mud-making has been going on for millions of years, and even the yearly mud-pie of the Yellow River is merely a drop in the bucket compared with the mud of the past. All over the world we see not only mountains worn half away, but signs that mountains have been worn down to their very base—not only the crumpled granite ranges of the early crust, but great volcanoes that pierced through the early mud. We find—more astonishing still—that the mud of destroyed mountains has risen again as rocky mountains from the bottom of deep seas, and has again been worn down. We find that this has happened many times in succession, until now the Earth is covered miles deep in mud and mud rock, and the only bits of its surface that are not mud or mud rock, are the volcanoes and the granite and basalt lavas that have forced their way through the mud.

All the great mountains of the world, except the volcanoes, are composed of sea-mud rock, and a great part of them—as the Alps, the Himalayas, and the Apennines—are built of lime mud previously built into sea shells. Rocks made out of mud deposited in the sea are usually known as *aqueous* rocks (from the Latin word *aqua*, meaning water), because they have been formed in water; or as *stratified* rocks (from the Latin word *strata*, meaning layers), because they have been laid down in layers on the sea bottom.

THE ROCKY DEEPS IN WHICH IS WRITTEN THE HISTORY OF THE EARTH

They were all originally part of the slag of the crust—either as slag actually in the crust, or as slag-lava driven through the earliest coatings of mud. Limestone and chalk and clay and sandstone are all examples of aqueous or stratified rock. The original rocks, such as are seen in granite and basalt and other lavas, are called *igneous* rocks (from the Latin word *ignis*, meaning fire), because they were forged by fire, and are not directly made from mud. Less than a tenth of the rocks are of this nature.

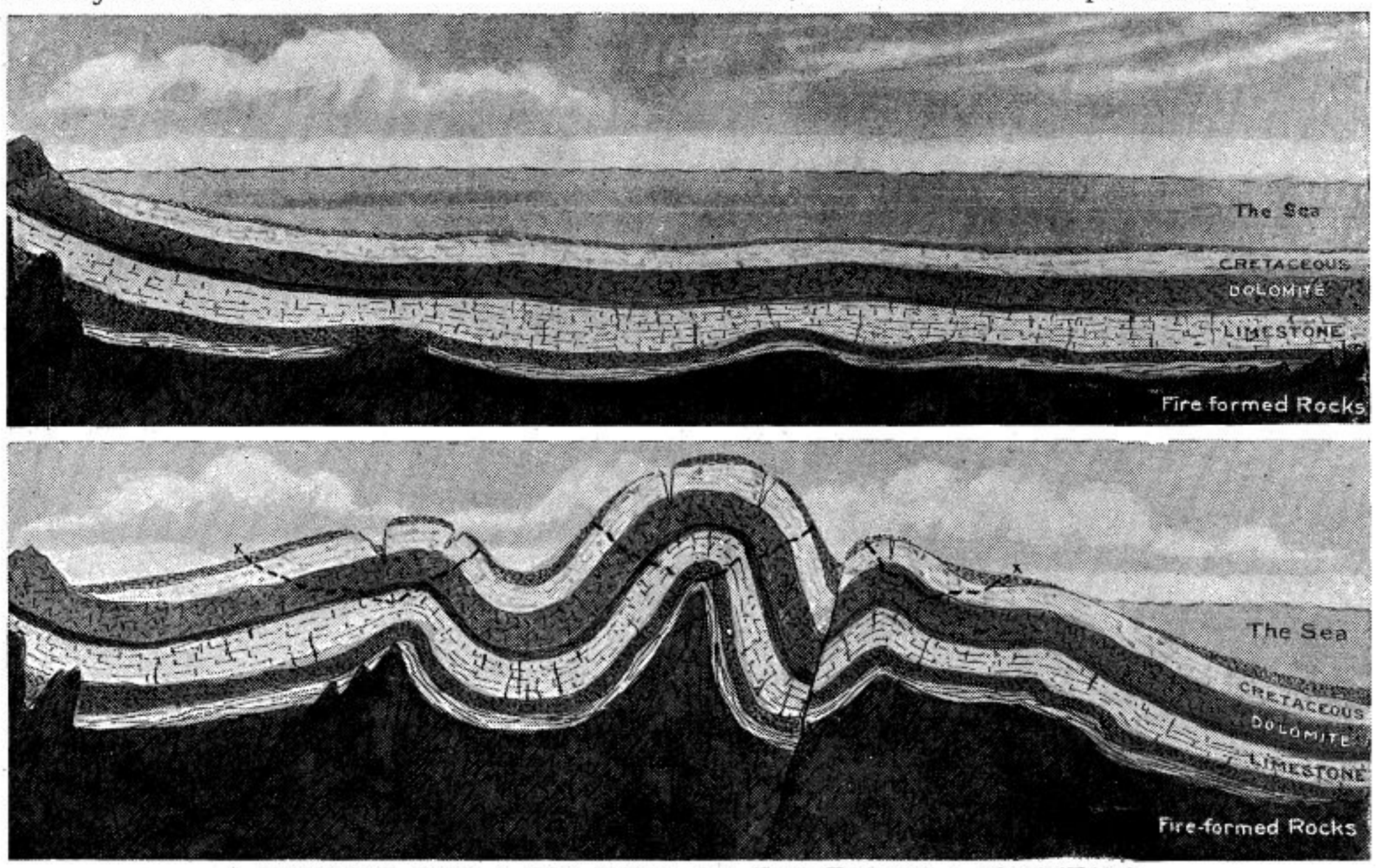
The making of mud from igneous rocks, and the destruction and reconstruction of mud rocks, has been going on for millions of years, and the examples we have given to show how quickly rivers make mud show that in millions of years huge quantities of rock must have been made and remade. How deep would all the layers reach if they had not been destroyed, but had been piled on each other!

Calculations, of course, are only very rough, but it has been calculated that from first to last they would reach at least 30 or 40 miles high, and some authorities say at least double that height. Professor Sollas thinks that even since the first

backboned animals appeared in the world mud 34 miles deep has been deposited. It is quite plain that, if the floor of the sea had not time after time risen into continents and mountains, there would be no land above water today. Even within three million years England will all be worn away and washed into the sea if there is no rising of the land to save her.

Of mud all life was made; on rock made of ancient sea mud and filled with ancient sea shells most men and plants now live; and without mud there would be no world as we know it. But the layers of the mud are also the illustrated history of the Earth.

it tells the history of the Earth millions of years ago when the mud was made, and we can say that in these early days England—or New Zealand, as the case might be—was under water and the sea was full of sharks or seaweeds; or that in these days the Arctic region had a tropical climate, with ferns and mosses growing to a great height, or that in other days the ancestor of the horse appeared; or at another time there were huge reptiles. By comparing the contents of layers with their position and their position with their contents, it is possible to put the layers of mud rock with their fossils—as the remains are called—in their correct position.



WHY WE FIND A SEA SHELL ON THE TOP OF A MOUNTAIN

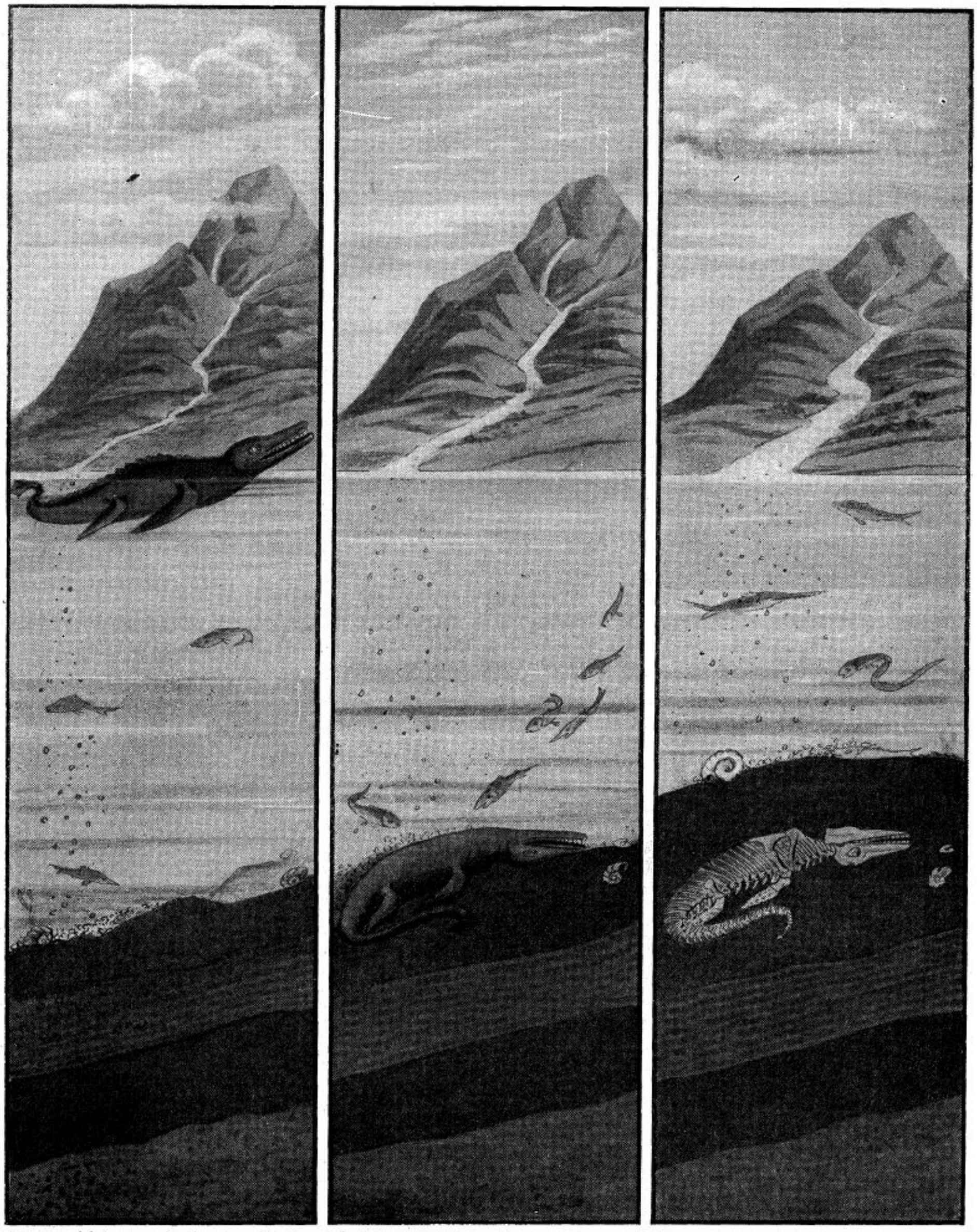
These two pictures explain how the mountains arose from the bed of the sea. The top strip shows layers of sedimentary rocks beneath the sea, and the bottom picture shows the gigantic folding of the rocks through the contraction of the Earth. Since this happened Sun, rain, wind, and frost have worn away the parts indicated by the dotted line.

When men began to study the *aqueous* rocks they found in them the remains of animals and plants; and geologists soon discovered that the remains found in the deepest layers of mud were very different from the remains we find in the layers nearer the surface.

By comparing the position and contents of such layers it is found that they could be arranged in chapters and leaves like the chapters and leaves of a history book, and that we could read the history of the world in this history book for millions of years. We know by the amount of mud laid down above a certain layer that

It does not follow that, because a layer is now on the top, therefore it is newly laid down. It may be on the top—as in the case of the very old rock in the island of Lewis—because the other layers have been worn off it. But geologists, by a process of comparison, got over that and other difficulties, and now, in the strata of the Earth, we can read the story of some of the changes in its crust and of the evolution of life—of the lifting of Mount Everest from the sea, the blossoming of the first flowers, and the coming of the first birds, and the slow ascent of man. This is a long, long story; its pages are

THE CHANGING EARTH FROM AGE TO AGE

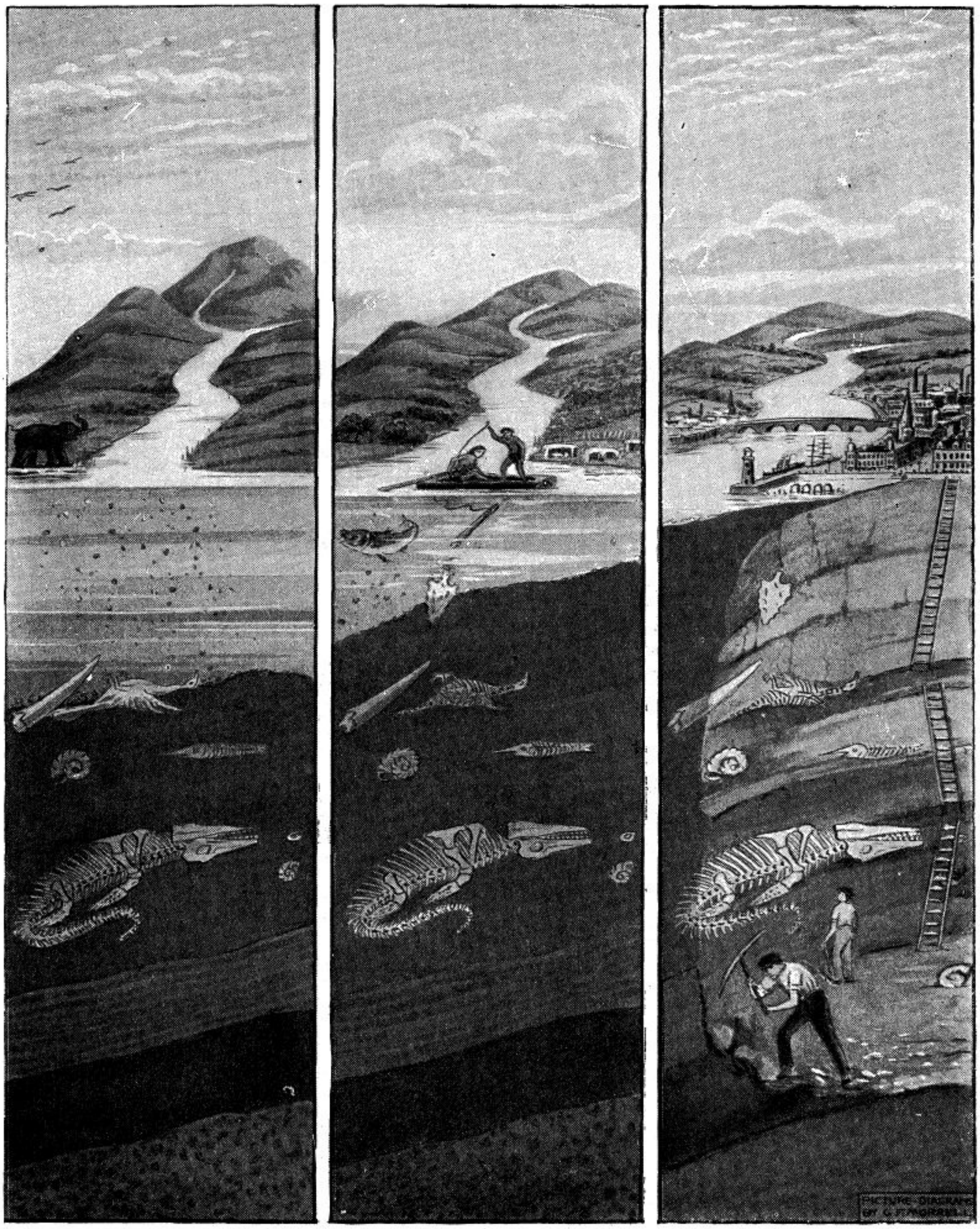


1. The history of the Earth for millions of years is written in its rocks, and men are able, by reading the rocks, to give us a vivid panorama of the Earth's long story. We can see also how that story came to be written in the rocks. A million years ago, a little stream trickled down a mountain, carrying sand and stones to the sea. In the sea swam the ichthyosaurus.

2. The ichthyosaurus was a reptile living in the sea, and its name means fish-lizard. It had a great head with powerful jaws and teeth, and its body had four limbs like paddles which enabled it to swim. One day this great creature died, and its body fell to the bottom of the sea. Meanwhile, the stones and sand brought down by the stream continued to fall.

3. As the ages passed, the stream wore away a wider and deeper bed for itself and became a river : and the rains falling on the mountain loosened the soil and formed hundreds of tiny streams, each running into the river. As the river became wider it brought down more earth and stones, which fell in a never-ceasing shower on the bed of the sea, and buried the reptile's body.

THE WONDER-STORY TOLD IN THE ROCKS



4. Higher and higher rose the ocean-bed as the mud from the mountain continued to fall, and the lower layers became hard rock. One day an elephant going to the river to drink broke off his tusk, and this was carried to the sea. Another day a bird was drowned, and fell on the ocean-bed. Dead fishes and shells also sank, and all were buried.

5. And then at last, hundreds of thousands of years after the ichthyosaurus died, men began to live on the Earth. One day a man who had made a boat out of a hollow tree-trunk took his wife and went out to fish, and the head of his harpoon broke off and fell to the bottom of the sea, and this also was buried in the mud.

6. The bottom of the sea crept higher and higher till at last it became dry land. Then one day men began to dig, and the world's wonderful story was revealed as we read it here. First the spear-head was found, then the tusk, the bird's skeleton, the shells, the fish, and at last the skeleton of the great reptile, all turned to stone.

at least 30 or 40 miles thick ; and all we have time to do here is to skim over some of the chapters. But the torn and fragmentary pages—some early, some recent—which lie open to our gaze in Britain, are specially explained and illustrated in these pages by our scientific artist, who, like a wizard, can call up animals and plants long dead.

THE CHIEF CHAPTERS OF THE LONG STORY-BOOK OF HISTORY

Skimming, then, through the wonder story told on Nature's tables of stone, we find that there are four chief chapters of the world's history since life appeared.

1. The chapter of very ancient life which we call Palaeozoic, from the two Greek words meaning ancient and life. This was the Primary Era, with periods which we call Cambrian, Ordovician, Silurian, Devonian, and Carboniferous.

2. The chapter of ancient life which we call the Mesozoic, from the two Greek words meaning middle and life. This is the Second Era, with periods which we call Triassic, Jurassic, and Cretaceous.

3. The chapter of more recent life, which we call the Kainozoic, from the two Greek words for new and life. This is the Tertiary Era—the Third Era—and its chief periods are the Eocene, Miocene, and Pliocene.

4. The chapter of life embracing the time of human history in which we live, called the Quaternary, or Fourth Period. It includes what we call the Pleistocene Period, named after the Greek words for newest and life.

THE FORMS OF LIFE FOUND IN THE EARLIEST ROCKS

Much the longest of these chapters is the first, containing the oldest certain remains of living things. There are hints of life in still deeper layers of the Earth's crust, and probably life in its simplest forms began long before the Palaeozoic rocks were made ; but the deepest pages of the stony history of life have been so crushed and heated that their story has been obliterated, and our history begins with the Palaeozoic Era. It is, of course, intensely interesting to find out what plants and animals existed then, millions of years before man.

Bits of this ancient chapter are found all over the world. In Britain it is found especially in Wales, and the first sub-chapter, the Cambrian, takes its name from the Latin name for Wales—Cambria.

But wherever the pages or fragments of pages occur, we find only rather primitive life—seaweeds and corals, crab-like creatures and sponges, and toward the end, fishes and insects and scorpions. As there were insects and scorpions, there was, of course, vegetation, and toward the end of the chapter we find great fern trees and giant mosses. Indeed, most of the coal we use is the decayed remains of the luxuriant vegetation that flourished toward the end of this chapter. The creatures most characteristic of this period were the trilobites—little lobster-like animals in shells, with compound eyes on the tops of their heads. Toward the end of this period amphibians appeared.

THE EIGHTY-FEET LIZARD, AND THE REPTILE WITH LEATHERY WINGS

The Mesozoic Period was rich in life, but especially rich in reptiles. It was indeed, the age of reptiles, and the rocks of this chapter are full of the fossils of strange reptiles now extinct. In the sea swam huge lizards such as the Plesiosaurs and Ichthyosaurs, and on land reigned the tremendous Dinosaurus, Brontosaurus, and Diplodocus. Diplodocus was over eighty feet long from the end of his snout to the tip of his tail, and Brontosaurus was even larger.

But more interesting and extraordinary than these was the Pterodactyl—a creature half reptile and half bird, with leathery wings twenty feet long, and at first with teeth in their jaws. Another reptile called the Archaeopteryx had feathered wings and a feathered tail ; we call this the first bird. In this period, too, even while the Plesiosaur and the Ichthyosaur swam about in the sea the little sea-creatures called Foraminifera were making the little chalk-shells which we see today in the white cliffs of Dover. Now also appeared the first mammals—probably little rat-like creatures.

The Kainozoic Period is the Age of Mammals, and toward the end of it appeared the greatest of all mammals—the mammal Man, whose large brain and skilful hand have made him lord of the Earth.

This, then, is a brief account of the making of the mud rocks and of the story they tell us.

Louis XVI

Robespierre

Danton

Carnot

Mirabeau

Voltaire

Jean Paul Marat

St. Just

Charlotte Corday

Madame Roland

Lafayette

Diderot

THE FRENCH REVOLUTIONISTS

BETWEEN the years 1789 and 1792 there were very great troubles in France, and violent changes took place. The French monarchy was turned into a republic, so that there was no longer a king at the head of affairs, because it was said that every country ought to be ruled according to the will of the whole people who live in it, and not according to the wishes of one man or of the few who have wealth and power. Yet after all, it was not very long before the French found themselves again being ruled by the will of one man, who became the Emperor Napoleon, of whom we read elsewhere.

But the changes which took place before that make up the story of what is called the French Revolution; and some of these changes in the government of the country and the life of the people have continued to the present time in France itself, and some have been adopted since that time in other countries of Europe.

We are going to learn something about the men and women who made the French Revolution, or tried to prevent it; but we shall not be able to understand much about them unless we first of all try to imagine the state of things which made people so determined to have a change that they allowed all sorts of terrible things to be done rather than stay as they were. In England there was a free government—that is, the people ruled through the Parliament, and the king and the ministers had to obey the law like everyone else. But in France the king and his ministers could do very nearly as they liked, so long as they did not interfere with the privileges of the clergy or the nobles.

But the common people suffered grievously by these privileges; for in the country places the peasants were almost the slaves of the great landowners, who were called the seigneurs. In nearly all the land, except in Brittany and the district called La Vendée, the seigneurs cared nothing for the needs or sufferings of the peasants; and although the seigneurs and the clergy had to pay no taxes, the peasants were compelled to pay heavy taxes, as well as to labour for the seigneurs without pay—all of which was very unlike anything known in Great Britain for more than 400 years. There were many people who for a long time past had been saying that all this was very wrong, and had been pointing out that people in England were much more prosperous; and among these were Voltaire and Diderot. But these two men did not arouse so much excitement as Jean Jacques Rousseau, who came from Swit-

zerland; for he had been brought up hardly, and had led a strange, wandering, discontented sort of life, failing in everything at which he tried his hand, until he took to expressing his ideas in books which at once made him famous.

The idea he had got hold of was that civilisation was all wrong, and that people would be much happier living in what he called a natural state, with very little law or government at all. He said that people who were strong and rich had persuaded the rest to serve them by pretending that they would protect them, and so had got the rulership into their own hands, and used it for their own advantage. In this way the poorer classes were robbed of their natural rights.

ROUSSEAU WHO TAUGHT THAT THE WILL OF THE PEOPLE SHOULD TRIUMPH

He maintained that everybody ought to make a new agreement or social contract, according to which everything should be settled by the will of the people; and that there should be no more kings or seigneurs or people who had privileges, but everything should be arranged in the way the people thought best. This teaching of his about the rights of man and the social contract became very popular.

All the seigneurs belonged to a group of great families who kept themselves aloof from ordinary folk, and they are spoken of sometimes as the *noblesse*, and sometimes as the aristocrats. There were a few of the aristocrats who were very much in favour of some of the new ideas that Diderot or Voltaire or Rousseau were talking about. The king had not nearly enough money to carry on the government, especially as there had been great expense owing to a war with England, and he was advised that the only thing to be done was to summon an Assembly of the Three Estates—as the Noblesse, the Clergy, and the Commons were called—and to consult them as to whether better arrangements could be made for governing the country.

THE TWO MEN WHO MIGHT HAVE SAVED FRANCE FROM THE GREAT TERROR

At this time there were two men who became notable as leaders of the people, both of whom belonged to aristocratic families—the one was Mirabeau, the other was Lafayette.

It was a very unfortunate thing that these two could not be friends, for what both of them wanted was to set up in France a government in which the voice of the people should be heard as well as the voice of the king and his ministers. Both of them had learnt a good deal in England or in America; for Lafayette had gone to America when he was only twenty, and had served under the great George Washington in the war which ended in the separation of the United States from England; so he had seen what Americans and Englishmen meant by freedom, and also how wise and great a man Washington was.

Mirabeau had lived for some time in England, and had seen there how it was possible for justice and law to rule everywhere without any oppression, and for both king and people to have a share in the government. But the least that either of them wanted would have made so great a change in France that the court and most of the aristocrats and the clergy would have nothing to say to them. And perhaps the saddest thing is that if King Louis had been a wiser man, those three working together—Lafayette, Mirabeau, and the King—might have made the French Revolution a peaceful affair, which would have set up in France a government not very unlike that of our own country.

THE GOOD KING LOUIS WHO TRUSTED BAD COUNSELLORS

Louis himself was a good man who wished to do what was right and just. He was a brave man, too. But he was not clever himself, and he was not like some other kings who have had the wit to choose good advisers and trust them. Instead of that, he trusted people who gave him bad advice, and who could see nothing but harm in the changes Mirabeau and Lafayette demanded when the Three Estates were assembled in what was called the States-General and afterwards the National Assembly. It seemed to them that to take away the privileges of the noblesse and clergy would be robbery, and that the proper thing for the common people was not to govern but to obey their betters.

Mirabeau understood what was needed better than any other man in France. He was a man who lived a wild life privately, and was always greatly in debt, which set a good many people very much against him; and he was domineering, so that it was not easy to be friendly with him. But he was a wonderful orator; so that, when the Assembly had come together bent on doing one thing, he could sometimes persuade it to agree to something altogether different. He would

THE TERROR OF THE LAST HOURS

MADAME ROLAND, WHO WENT TO EXECUTION SAYING—"O LIBERTY, WHAT CRIMES ARE COMMITTED IN THY NAME!" IS MOCKED IN THE PRISON GROUNDS

THE PROUD COURAGE OF CHARLOTTE CORDAY IN THE HOUR OF HER DOOM

rouse people to be enthusiastic when they were timid and hesitating; and in this way he had a great deal of power, though people were really afraid to trust him.

He was called the Tribune of the People, because he was so bold in demanding what he considered the people ought to have, and because he wanted the "privileged orders" to have their privileges taken away and to pay their proper share of the taxes.

HOW MIRABEAU TRIED TO BRING THE KING AND THE PEOPLE TOGETHER

But Mirabeau saw, too, that many who had come to the Assembly had no idea as to what good government meant. The Assembly was not fit to be the real ruler; he wanted it to have power, but he knew that the only way to prevent terrible things happening was for him to become the real ruler himself. He wanted the people to trust him, and he wanted the king to trust him; but presently it came about that, while the king suspected him of being on the side of the people and against the crown, the people, and those who had most influence with them, suspected him of being really on the side of the crown against the people, when the thing he was actually striving to do was to unite crown and people for the good of both.

Several of the changes Mirabeau wanted were made, but unfortunately, before there was any real chance of bringing the king and the people into agreement, Mirabeau died; he tried to do such an immense amount of work that he wore himself out, and as soon as he fell ill, death overtook him quickly.

Lafayette was a very different kind of man He was a popular and high-minded gentleman, who had won great praise as a soldier when he was fighting in America under Washington. After the States-General had come together, and had been turned into the National Assembly it was found very difficult to keep order, because everyone was in a state of excitement.

LAFAYETTE WHO TRIED TO KEEP ORDER IN PARIS AND DISPLEASED ALL PARTIES

So the better class of the citizens in Paris were enrolled as soldiers in what was called the National Guard, to keep order; and Lafayette was made their general. He was very popular among them, and some people began to think he meant to make himself the real master by the help of his soldiers, like Julius Caesar in Rome or Oliver Cromwell in England. Besides, it was not very easy for the poor people to believe that so fine a gentleman as Lafayette cared much about them; and the noblesse hated him because they thought he had deserted their order; while the queen and court disliked him because they thought he was trying to become dictator.

At last, when there was a great riot and Lafayette had to order his soldiers to attack the mob, the common folk liked him less than ever, and he found that even his soldiers were only half inclined to obey him. He always wanted to check violence; but he could not sway men as Mirabeau could. So, when more violent men got the upper hand, Lafayette no longer commanded the National Guard. Later, when France declared war against Austria and Prussia, he was sent to command the French army; but Paris became so disturbed that he wanted to take the French troops back there, and when he found that he could not do so he would not remain in command, but left the country.

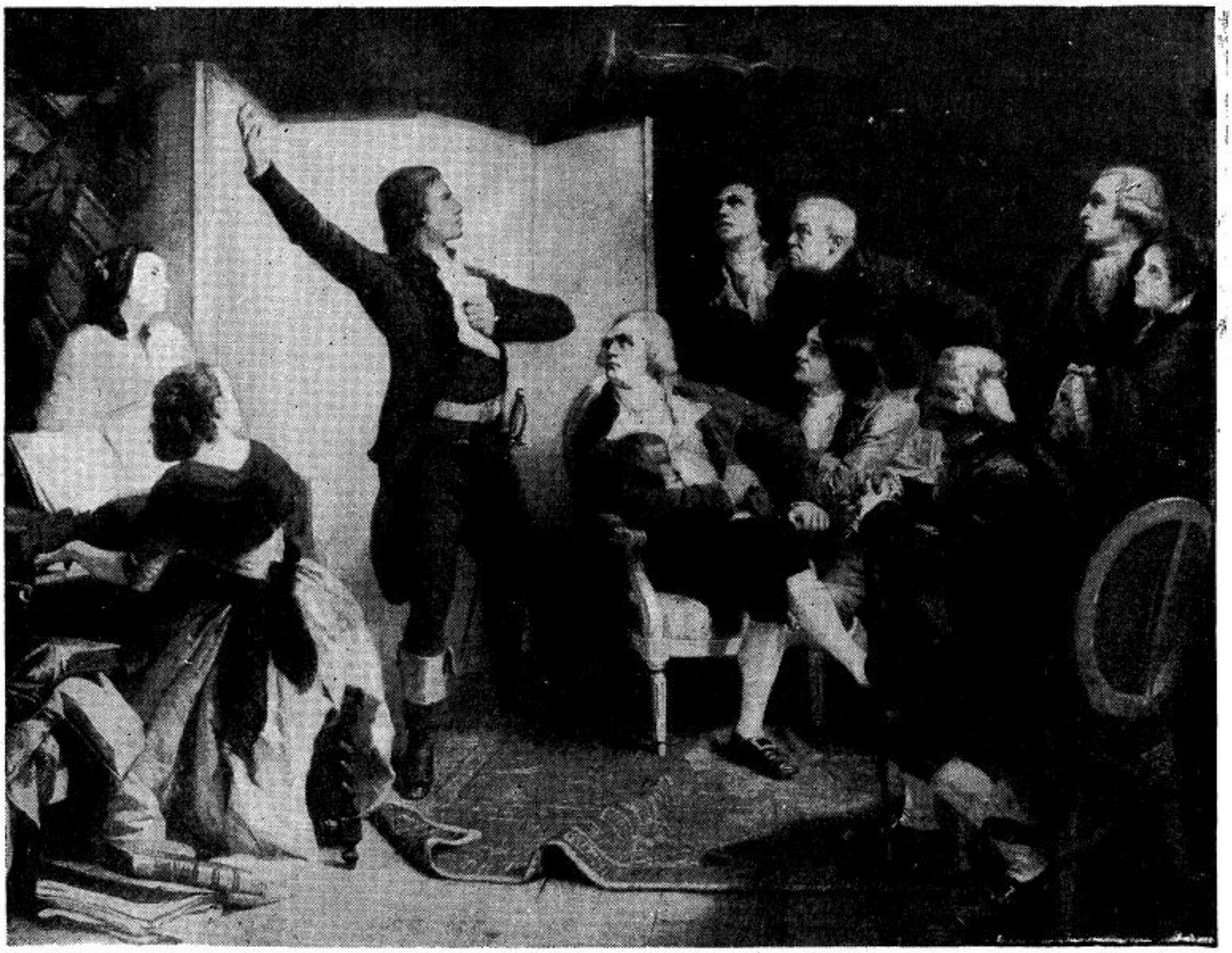
HOW LAFAYETTE HELPED TO BRING BACK A KING TO FRANCE

As for what befell him afterwards, he was made prisoner by the Austrians, and after spending some years in prison he was set free again. Later, he helped in the restoration of the Bourbons, as the French dynasty was then called, and, at the end of his long life, he helped in another little revolution when the Bourbons were turned out again, and their cousin, Louis Philippe, was made king in their place.

Now let us look at the king and queen, whose story is so tragical. Louis always meant well, and would have been quite willing to grant much more power to the people and to put an end to bad laws and customs; but the people round him were always persuading him that if he allowed one thing or another to be done, the king would never again have any power; and Louis thought a king had no right to give up his power. So he could never make up his mind to trust either Mirabeau or any other of the leaders of the people, or, on the other hand, to take up his stand boldly as a monarch determined that his will should be obeyed. In one way he was a brave man, for he had no fear of death, but he had not the other kind of courage which enables a man to resolve on a plan of action in which there are risks, and to carry it through in spite of all dangers and difficulties.

SINGER AND MONSTER OF THE REVOLUTION

THE MONSTER ROBESPIERRE FACING HIS CAPTORS. HE IS THE SITTING FIGURE



THE FIRST SINGING OF THE MARSEILLAISE, THE SONG OF THE FRENCH REVOLUTION, COMPOSED BY THE SINGER IN THIS PICTURE, ROUGET DE LISLE

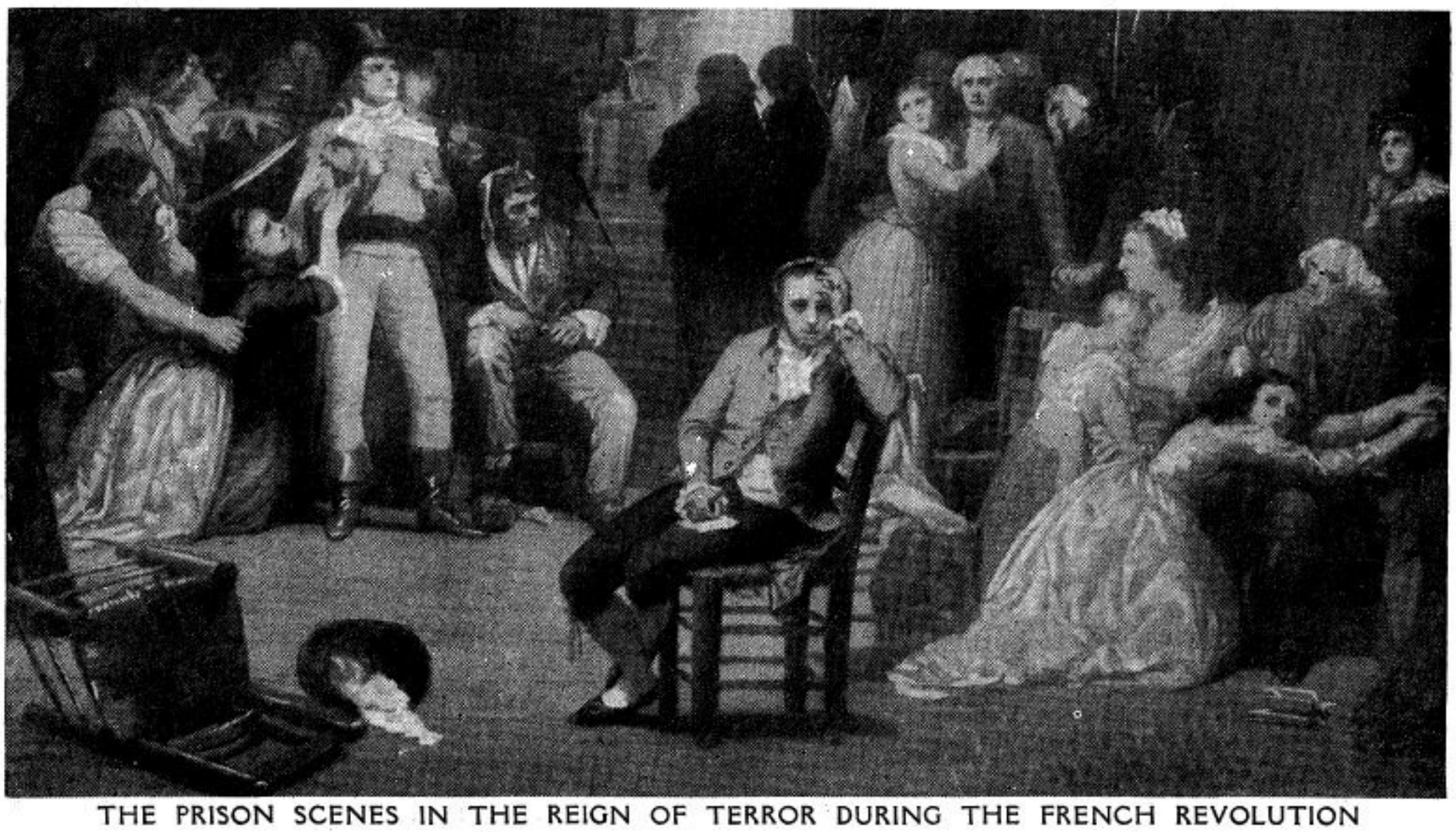
Soon after the death of Mirabeau the king and queen thought the best thing they could do was to take flight out of France; they thought that then other kings would help them to recover their power, for the queen was the sister of the Emperor of Austria.

They made preparations secretly, and fled by night from Paris in a carriage, pretending to be just a gentleman and his wife. But at a place near the frontier the king was recognised when he got out of his carriage, and they were stopped and sent back to Paris, where they were kept under strict guard.

Louis accepted the new rules for governing the country which the Assembly had prepared, and so he was still king. A new Assembly was called, but the king had no able men about him now whom he could make ministers, and the cleverest men he tried would not do as he wished, or serve him if he did not do as they wished. And at this time, because the Austrian Emperor and the King of Prussia threatened to interfere, Louis was forced to declare war against them; while the men who were called Jacobins, which was the name of a club to which they belonged, were stirring up feeling against the monarchy, and Paris was getting very much excited.

One day there was a great procession, which found its way into the royal palace of the Tuileries; and the King of France was made to set on his head the red cap of liberty. The queen, too, had to set one on the head of the little Prince Royal, the heir to the throne. No real harm was done that time; but when ill news came from the war, and the Prussians made a proclamation that Paris would be punished if the king suffered any hurt, the people became furious.

The royal palace was attacked by a mob thirsting for blood; the valiant Swiss Guards, who defended it stoutly, were cut to pieces. But the king and queen had fled with the rest of the royal family and taken refuge with the Assembly. Then there came another new Assembly, which was full of Jacobins, and of others who wanted a republic, and who were called Girondins; and the new Assembly proclaimed that France was now a republic,



THE PRISON SCENES IN THE REIGN OF TERROR DURING THE FRENCH REVOLUTION

and the king and queen were merely citizens. And even before this the Jacobins had put to death a number of supporters of the king who had been thrown into prison, in what were called the September massacres. The next thing was to bring the king himself to trial, as Charles Stuart had been tried in England 140 years before. Louis was tried by the Assembly itself, and condemned to death.

Like Charles the First, Louis showed a royal dignity and fortitude. He was beheaded, not with an axe like Charles, but by an instrument called the *guillotine*, which had been brought into regular use in France by this time. King Louis' own cousin, Prince Philip of Orleans, was one of those who voted for his death.

THE POOR ROYAL FAMILY OF FRANCE

MARIE ANTOINETTE WALKS TO HER DEATH

MARIE ANTOINETTE, LOUIS XVI, AND THEIR CHILDREN IN THEIR PRISON CELL
From the painting by E. M. Ward, R.A. in Preston Art Gallery

The poor queen and her children remained prisoners for a long time. Marie Antoinette deserves to be pitied, for, though she had not always been wise, yet when misfortune came upon her, she behaved with splendid courage; and it has always been counted among the wickedest deeds of the Jacobins that she, too, was sent to the guillotine by them, nearly a year after her husband.

She was not yet forty when she was slain; but the long, terrible months of anxiety had so changed her that she seemed almost an old woman. When she became Queen of France she was still a beautiful and attractive girl who had never known what it was to have her will crossed, and had been taught to take it for granted that kings and queens have a right to go their own way, so that she always encouraged the king to resist. She died her ignoble death like a queen.

One woman is famous who was on the side of the Revolution. The party who wanted a republic in France was divided in two, the Girondins and the Jacobins; and of these the Jacobins were much the fiercer. The Girondins wanted a republic like that of ancient Rome; they did not wish to destroy for the pleasure of destroying.

THE NOBLE MADAME ROLAND, WHO DIED BECAUSE SHE TRIED TO SAVE OTHERS

Madame Roland had great influence among the Girondins, and was accounted a woman both noble and wise; but after the king had been slain, the Jacobins got the upper hand altogether, and turned upon the Girondins, who wished to check bloodshed. Many of them were flung into prison, among whom was Madame Roland; and many were sent to the guillotine, though they had striven their hardest for liberty. And so it was that Madame Roland died in the same way as Marie Antoinette. "O Liberty!" she cried on her way to the guillotine, "what crimes are committed in thy name!"

No space is left for extended mention of lesser actors in the drama of this wild period—men like St. Just and Carnot—but three who are commonly named together must be pictured. One of these came very near to being a great man.

This was Danton—terrible, fearless, ruthless. It was he who caused the September massacres, because he thought that was the only way to make sure that there would not be a rising of the royalists, just at the moment when it seemed that foreign armies might be marching on Paris. And it was he who spoke these fierce words when the kings of Europe seemed to be gathering their forces to crush the French Republic: "To the kings we will fling down the head of a king as the gage of battle"—meaning that Louis should be beheaded. After that he would have joined hands with the Girondins in checking bloodshed, but they would not join with him; so he held by the Jacobins, yet still strove to stay their bloodthirstiness. And again the more cruel among them got the upper hand, and Danton, in his turn, was sent to the guillotine.

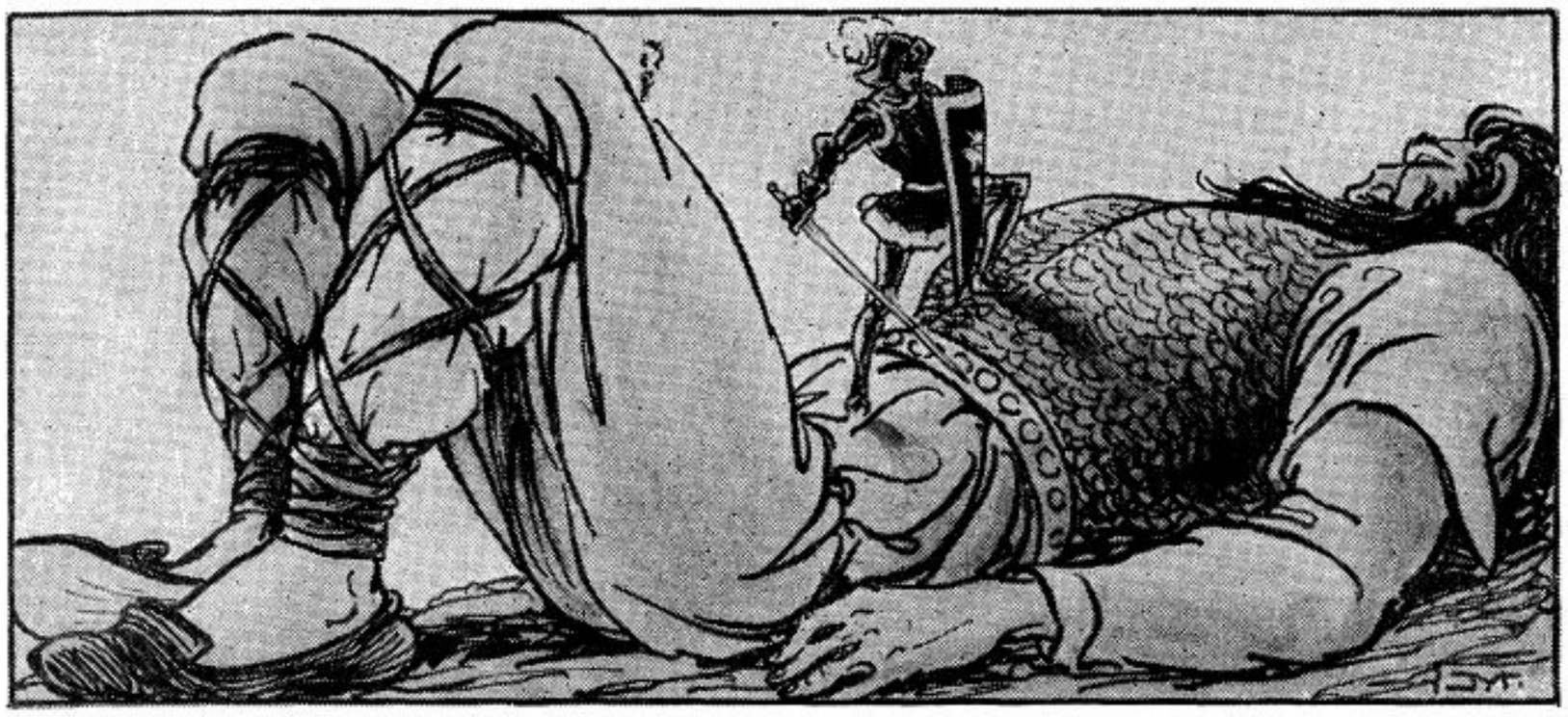
HOW A YOUNG GIRL RID FRANCE OF A BLOODTHIRSTY TYRANT

The second of the three was Marat, who called himself the "friend of the people," foul of speech, craving for blood, ever urging death for the aristocrats. He did not die by the guillotine, for his wickedness so stirred the heart of a girl named Charlotte Corday that she thought it was her mission to free the world from such a monster. So she came to Paris, and, being admitted to speak with him, drew a dagger and slew him; for which deed she, too, died under the guillotine.

The third was for a time the most powerful of them all. This was Maximilian Robespierre, a little, unhealthy-looking man, who would have been simply a respectable citizen if he had remained in private life. But he had one idea in his head which he was quite determined to carry out. This was that the will of what he called the Sovereign People must rule, and the way to bring that about was to destroy everything that could possibly stand in the way—kings or aristocrats, Girondins or Jacobins, men or women, young or old. He got all the power in his own hands, till at last, the guillotine was killing fifty people every day.

THE END OF THE TERROR AND THE DEATH OF ROBESPIERRE

Then even his own supporters grew weary and disgusted, and turned upon him; and he, too, went to the guillotine. When his head fell, those who stood by shouted for joy. With his death, the Reign of Terror came to an end, and the ruling of the French Republic passed into the hands of a group of people called the Directory, until Napoleon arose.



JACK THE GIANT KILLER

IN the days of King Arthur there lived a farmer's son named Jack. Not far away from Jack's home was a cave, and in the cave lived a horrible giant, who was called Cormoran.

Cormoran was three times as big as any other man ; his appetite was so enormous that the only way to get enough food to eat was by stealing all the sheep and oxen that he could find. For one meal the giant could eat as much as six oxen and twelve sheep, and Jack's father said that if this went on much longer all the farmers for miles round would be ruined.

This set Jack thinking, and, being a brave lad, he determined to plan out a way to kill the giant.

So one night Jack set out for the mount on which was the giant's cave. With a spade he dug a deep pit and covered it with sticks and gravel, so that it looked like earth. Then, when all was ready, he blew a loud blast on his cow-horn and waited to see what would happen.

The giant awoke in a terrible rage, and came stamping down the mount to see who had dared to come so near his cave. Suddenly he caught sight of Jack.

" You young rascal ! " he cried. " I'll kill you and eat you for my supper ! "

He rushed after Jack, but just before he reached him his foot caught in the pit, and down he came, crash ! Up jumped Jack, and in a twinkling he drew out his axe and chopped off Cormoran's head.

Jack ran all the way home, and the farmers were so delighted at being rid of the monster that they presented the hero with a sword, and named him " Jack the Giant Killer."

Jack was so proud of his success that he determined to rid the world of another monster, named Blunderbore, who lived in a castle in the midst of a lovely forest.

Jack set out bravely, but the day was warm, and he had not gone very far when, overcome by the heat, he lay down under a tree and fell asleep. Soon Blunderbore came along, and, catching sight of Jack, he picked him up, flung him over his shoulder, and carried him to his castle.

When Jack awoke and found himself in the giant's castle he was in a terrible fright. Through the windows he could hear the cries and groans of the giant's other victims, and his teeth began to chatter.

" This is dreadful," said he to himself. " I must find a way out somehow."

Just at that moment Jack heard voices in the courtyard below, and, peeping through the rails of his prison window, he saw Blunderbore and another giant enter the castle. Looking round, he caught sight of a coil of rope which lay in a

corner. He made a noose at each end of the rope, and, grasping the middle firmly in his hand, he flung an end over the two giants' heads. Quick as lightning, he swung the rope round a beam by the window, and then, holding on to it with all his might, he pulled it tighter and tighter until both giants were strangled.

Jack set free all the knights and ladies whom Blunderbore had imprisoned in his castle, and set out again in search of new adventures.

The next evening he found himself at the door of a lonely castle in Wales. He knocked, and, to his amazement, the door was opened by a tremendous giant with two heads. Jack was startled; but the giant seemed so friendly that when he offered him a bed for the night Jack, who was beginning to feel very tired, gladly accepted his hospitality.

Now, Jack knew that this two-headed monster had four valuable treasures, which he determined to possess—a coat that made the wearer invisible, a cap that told him all he wanted to know, a sword that could cut anything, and shoes that could carry him as swiftly as the wind. Jack went to bed, and soon fell asleep. In the middle of the night he was awakened by someone singing; and these were the words he heard:

Though you shall lodge with me this night,
You shall not see the morning light;
My club shall dash your brains out quite.

"Ho, ho!" cried Jack, looking round for a log of wood which he had noticed by the fireplace. Jack put the log in his bed, and waited. Presently the door opened, and in came the giant and strode up to the bed. Down came the club—crash! again and again, and very thankful Jack was to have escaped the blows.

"Farewell, my young friend," the giant bellowed. "You'll make me a fine dinner by and by."

Jack had a good laugh over this, and when he was quite certain the giant had gone he crept back into bed, and was soon fast asleep.

In the morning Jack walked boldly into the room where the giant was breakfasting from a huge basin of batter pudding. The giant was so tremendously astonished at seeing Jack alive that he scarcely knew what to say to him.

Jack sat down, and began to make a good breakfast. But all the time he ate he was thinking. Suddenly a grand idea came into his mind, and when the giant was not looking he hid as much of the pudding in his jersey as he could possibly squeeze in. As soon as they had finished breakfast Jack said to the giant:

"*You* can't plunge a knife into your chest without hurting yourself. Just watch and see *me* do it."

Picking up a knife, Jack thrust it into his jersey, and out fell the pudding, piece by piece, upon the floor.

The giant did not like to be outdone by such a little creature as Jack, so he drew out his own knife, and, without more ado, plunged it straight into his chest—and fell down dead.

Then Jack caught up the cap and the shoes and the coat and the sword, and went on his way. At the next castle to which he came a grand ball was taking place. The knights and ladies, who had all heard of Jack, made him welcome, and he was just beginning to enjoy himself when in rushed a messenger to say that a hideous giant was on his way to the castle.

"Have no fear," cried Jack, hastily fastening on his invisible coat. "Leave everything to me."

He put on the shoes which carried him as quickly as the wind, and went out.

Round the castle ran a moat, and when the giant reached the drawbridge that stretched across it he sniffed the air around, and roared in an awful voice:

Fe, fi, fo, fum,
I smell the blood of an Englishman;
Be he alive, or be he dead,
I'll grind his bones to make my bread.

"You must catch me first!" cried Jack; and then, throwing off his coat, he led the giant a fine dance round the castle.

Jack ran on swiftly until he came again to the drawbridge. He ran across, but as he reached the other side he bent down, and with one stroke of his magic sword severed the bridge in two just as the giant was half-way across. Down crashed the drawbridge, and into the moat fell the giant; and that was the end of him.

Jack had many other adventures, and when he was tired of them all he went home again, and married a beautiful princess whom he loved dearly.

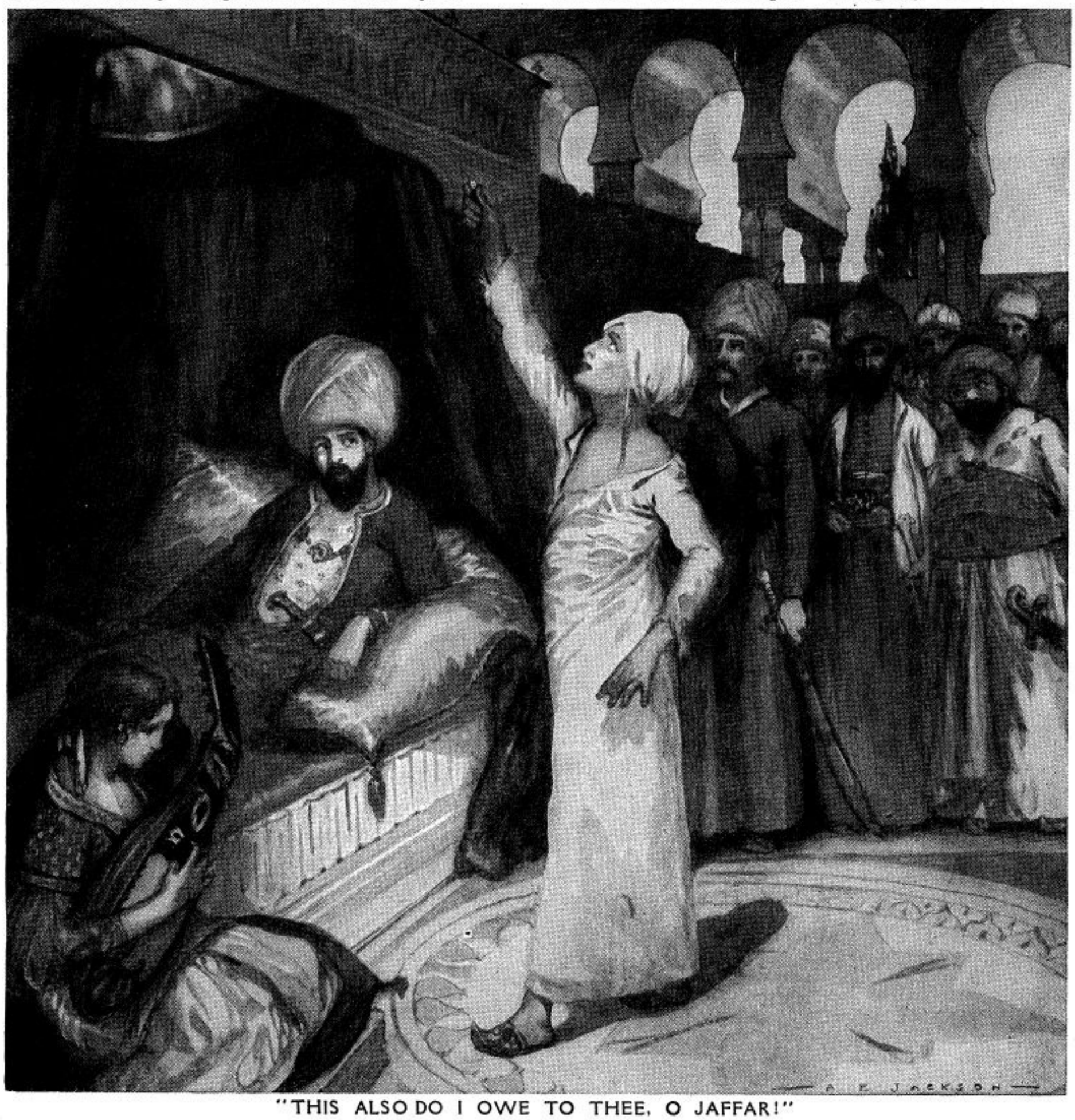
THE MAN WHO DID NOT FORGET

ALONE in a little chamber of his palace at Baghdad the great Caliph Haroun al Raschid reclined upon a divan, his hands motionless in his lap, his eyes fixed upon the opposite wall, his head bent as if it carried a burden. So still did he sit, so set and fixed was his posture, that one might have thought him dead but for the extraordinary brightness of his eyes.

upon the perfumed chamber, the floor of which was strewn with rugs, deep and soft.

A delicate piece of tapestry hung across the arch which gave an exit from this delicate chamber to the rest of the palace.

The light was dim, the air was cool and fragrant, the soft spraying sound of a fountain came from an inner courtyard. The branch of a creeper hanging across the



"THIS ALSO DO I OWE TO THEE, O JAFFAR!"

The ceiling of this little chamber, gemmed with precious stones, was carved into the likeness of a flower ; the hexagonal marble walls, save only at the entrance and where a balconied window looked down through the tops of trees to the roofs of the city, were panelled with fretted ivory, so beautifully wrought that, while the Caliph could look out from them, no one could look in

window stirred lightly in the breeze, all the little leaves shimmering with sunlight.

Silent and motionless sat the great Caliph in this chamber, but in his soul there was a storm of passion. By his order, in a fit of jealous rage, the Vizier had been slain—the great Vizier Jaffar, adored by the city and held in highest honour throughout the Caliph's dominions,

a man of goodness and purity, of kindness and justice, of truth and mercy.

Haroun had killed him. And now, troubled by the murder, bitterly repentant and filled with remorse for that wanton and abominable crime, he was afraid—afraid of the people. For the people, shocked by the murder, had uttered a universal cry of sorrow and grief, a wailing that had risen up from the huddled streets of Baghdad even to the chambers of the Caliph's palace.

Jaffar was dead—Jaffar, the friend of the poor and helpless, the just judge, the kind governor, the good and holy man of simple honour and true courage! He was dead, this protector of the poor, this merciful and humane judge. Who would now befriend them?

Very ill came this cry of the city to the ears of Haroun. It accused him and it threatened him. He had the right to slay whom he would; none had dared ever to question this right. But now—now——

In his wrath he had sent an order throughout the length and breadth of Arabia that any man who dared from that hour ever to utter the name of Jaffar should surely die. The man was dead; the name was to die too. Haroun commanded that his memory should be utterly blotted out.

And now he sat alone, knowing that he was defied. For messengers had come to him saying that a man in the city—named Mondeer—stood daily in the central square crying out the name of Jaffar, and telling men to mourn for him, to cherish his memory, and to tell their children of his goodness and justice and mercy, even if death were the cost.

Haroun had trembled in his soul at their tidings. But his brow had darkened, his eyes flashed, and in a voice of storm he had commanded this disobedient dog to be brought into his presence.

Suddenly he rose from the divan, tall, magnificent, and full of grace, a handsome man indeed, and strode swiftly, silently, across the rugs to the balconied window, standing there for a moment and looking down upon the roofs of the city with trouble in his eyes. Then he turned away, and crossed as swiftly and silently to the archway of the chamber, thrusting the tapestry aside, and descending marble stairs to the courtyard where the fountain was playing.

Slaves rose in the shadows of this wide and darkened place, and salaamed to the ground as the Caliph crossed the floor and went on his way.

He descended more stairs, and came to the audience chamber, where soldiers stood at the entrance and a crowd of his ministers was gathered before the throne. He strode through these people, who fell back at his approach, salaaming to the ground, and at last he reached the throne, where he stood with his back to the silent company for a long while, thinking within himself how he should act.

Then, turning abruptly and seating himself, he made a sign. Mondeer was brought in, slaves fastening the knots of the cords which bound him.

"Tie well, friends!" cried the prisoner. "Bind fast, and fear not to hurt me!" He raised his eyes, looked upon the Caliph, and said, "Welcome to me, very welcome, are these wounding cords that bind me powerless and fast; for I was bound faster and my lot was more sorrowful still when Jaffar found me, loosed me, set me free. And these cords bring back to my memory that gracious deed of his, they awake in my heart new love for him, new love, fresh reverence, and deeper gratitude, and therefore are they welcome. Honoured be thy glorious name, O Jaffar, for ever and evermore!"

While he spoke the soul of the great Caliph was kindled. To kill such a man were beneath the dignity of a king; to honour and befriend him might turn the tide that had gone out so far from the palace walls.

An overmastering hunger to deserve such love and gratitude from his people visited the heart of Haroun. He envied Jaffar in his grave. He coveted the loyalty of the living prisoner rejoicing in his cords.

"Friend," said he, bending his eyes upon Mondeer, "you have gratitude in your heart, and gratitude excuses all excess. I pardon and forgive you. More, since gifts so touch your heart, with my pardon and forgiveness I bestow upon you liberty and this great diamond, unequalled in the world, the proudest stone that shone in the Tartar's crown. Take it, and hold me in your heart as you deem fit."

The prisoner was unbound. He stretched forth his hands, his eyes shone more brightly than the diamond, and lifting the priceless gift heavenward, his eyes raised, he cried out in a voice of love:

"This also do I owe to thee, O Jaffar! Honoured be thy name for evermore!"

THE BRIDGE OF MONKEYS

ONCE upon a time lived in India a great hero named Rama. No one had ever fought such great fights as Rama, or performed such wonderful deeds; and the people of India reverenced him like a god.

One day Rama went to a distant court where lived Sita, the most beautiful princess in India. He fell deeply in love with her, but was told by her father, the king, that the man who won his daughter Sita was to prove his strength and bravery and endurance in many ways.

Rama was determined either to win Sita or die, so he set himself to overcome the obstacles. Many of them proved quite simple, but the last of the deeds to be done was of such an impossible nature that all previous men had been unable to accomplish it. The task was to bend a mighty bow made and given by the gods to the father of Sita. Now, until this time, no man had ever been able so much as to lift the bow out of its iron case; but Rama not only lifted the bow; he bent and broke it, with a mighty crash.

So Rama won and married the beautiful Sita, and, accompanied by his brother, Lakshmana, went away from the court to his hunting lodge in the forest.

There they were very happy, for Rama was a mighty hunter and the forests were full of game. Every day either Rama or his brother went abroad to the chase, leaving the other to guard Sita from the evil beings who lived in those days in India.

From one demon in particular were they anxious to guard her, and that was Raksha, a terrible monster, part man, part beast, who had sworn to capture her. Raksha had always been Rama's greatest enemy. Time after time had he crept up to Rama to kill him, and after a terrible battle had been driven away.

One day Raksha sent a great golden deer roaming through the forest, such a deer as had never before been seen. Sita herself saw the beautiful animal, and implored Rama and Lakshmana to capture him that she might have the skin. Raksha, lurking in the forest, saw in the distance the two men stalking the deer, and his evil eyes shone with fiendish delight. He flew to the hunting lodge, and swooped on Sita as she sat singing in the sun.

No words can tell the anguish of Rama when he returned from the chase. For miles and miles in the forest he sought his lost princess, and in every nook and corner of the house. Then round and round the building he ran, calling on the name of Sita till the woods echoed again and again with the sound.

Now Rama had many friends, not only among human beings, but among the animals. Jambuvana, the king of the bears, worshipped him; and Hanuman, the monkey god, loved him.

"Grieve not, my beloved Rama," cried Hanuman; "we will find her."

Now Hanuman, though a monkey, was the son of a god and had great power. He made a magic circle in the clearing and called a great council to help in his search. First he called the below-earth animals that live in rivers or burrow their way in and out of the earth's surface—the crocodiles, frogs, snakes, rabbits, moles, rats, and sloes; but none had seen Sita.

Then Hanuman called the over-earth animals, those who travel from place to place—the leopards, panthers, cats, jaguars, bears, elephants, rhinoceroses, tigers, boars, and wolves; but none had seen Sita.

Then Hanuman called the air people, the birds; but none had seen Sita.

Then he called his own people, the tree-top people, the monkey folk, who live neither in the air nor on the earth, who are neither animals nor humans, but something between; and none had seen Sita.

The grief of Rama became too great to bear, and he lay on the ground like one dead. All the animals waited in silent droves, and Hanuman wept till the grass was drenched with his tears.

Presently a commotion arose among the air people, for the king of the vultures was descending through the skies.

"I have found her, O Rama the Great!" he cried. "The demon Raksha is carrying her southward to his territory."

Then the chase began.

Hanuman, whose strength was boundless, took Rama and Lakshmana on his back, and bore them, swifter than a hurricane, through the tree-tops. The monkeys followed in joyous, chattering hordes; the birds flew overhead; the droves of animals followed through the forest; the vulture king soared among the clouds, with unerring eye leading the way; and all tracked Sita.

The chase went on, and day followed day, until the pursuers reached the strand and the blue sea. There they halted, for the bird was descending.

"The demon has carried her over to Ceylon," cried he to the monkey god.

Then Rama trod the beach in furious anger, baffled; and Hanuman fell into thought. It was not possible for even him to carry Rama across to Ceylon. How could that gulf of water be bridged?

At last the idea came to him. He called his own people to a private council in the trees. And the monkeys understood. There came from them such a wild chattering of joy as was never heard in the wide land of India. It was they who were to construct the bridge for the mighty Rama, and afterwards help to fight the demon hordes in Ceylon.

Swiftly the deed was done. One grey and savage leader of a tribe, the strongest of the monkey folk, leaped to the nearest tall tree, and hung there with his powerful arms. The next ran across his body and clung to him, and the next, and the next, and the next.

And so the living rope grew and swung, pendulum-wise, while Hanuman prayed to the high gods for its safety. Quickly the monkeys fled along the swinging line, until, with a mighty shout, the last monkey flung himself on a tree-top in Ceylon; and the bridge was made.

Raksha, the demon, with his unhappy prize, had gained Ceylon, and fancied himself safe. He pictured the return from the chase and the search for Sita. He knew no living animal had seen him, and he thought Rama would for a long time be unable to trace him. But even as he gloated over his successful capture there came on his ears a terrible sound—the sound of thousands of monkey folk shrieking and yelling for joy because Rama, their beloved, had crossed the bridge they had made, and was safely landed in Ceylon.

Then he called his hordes of evil beings to him, and a great and terrible battle took place between the monkey folk and the followers of the demon. But Rama and Hanuman were always at the front of the battle, fighting fiercely; and at last, Raksha was captured and slain, and the beautiful princess, happy once more, was carried back in safety to India.

A KING INDEED

TWILIGHT was falling on the Himalayas, but still the man and the dog toiled on.

The animal was a stray which had been following for some time. The man was a king and a hero. Yudhishthira had been one of the five young princes whose heroic adventures will be sung as long as the land of India stands above the sea. Now he was the last left; his gallant brothers and Drupadi, the bride whom they had won in such peril, who had shared exile and danger and final triumph—all were gone. Life held no sweetness without them; he was old, and weary of his crown; in the mountains he sought a peace that he could not find in the world.

Suddenly there appeared a bright spot in the sky. The radiance drew nearer and nearer. Yudhishthira beheld a heavenly being in a golden chariot; it descended to his very feet. As he gazed in wonder the vision spoke:

"Just and valiant king! I am Indra, and I come to carry you to the skies, for your life has made you worthy to sit with the princes of the stars."

Yudhishthira replied with awe and sorrow, "Holy one! Even if I were fit to mingle with the kings of the sky I would not go without my brothers and Drupadi."

"They await you," replied Indra, and joy and thanksgiving filled the old man's heart. He prepared to mount the chariot but stood aside to let the dog enter first.

"No!" cried Indra, "I came to fetch a hero, not a dog. The humblest peasant holds a dog to be unclean; if it be refused the poor man's hut how shall this scavenger enter the home of the gods? Heaven itself would be polluted."

"Then," said Yudhishthira, "I cannot come with you either. I cannot desert a creature that has followed me in my sorrow and loneliness. All that you urge against the dog binds me to him. Because he is despised and friendless I must protect him. It is the duty of a king."

In vain Indra argued. On the one hand was celestial happiness with his kinsfolk; on the other earthly misery with the dog.

Yudhishthira only replied that in Heaven itself he could not be at rest with such a treachery on his conscience. Said he: "Are there any stronger claims on a king than devotion and weakness?"

Nothing could move him. Then as he turned away from Indra he saw a shining youth where the dog had stood. The Immortals themselves had not shrunk from putting on the likeness of the unclean animal to test his kingship.

Then the king, who would resign his crown, but never give up a follower, consented to enter the chariot of the stars.

THE THREE BEARS

THREE bears lived in a house in a wood. There was the father bear, the mother bear, and the baby bear. The first was a great big bear, the second was a middle-sized bear, and the third was a tiny wee bear. In the kitchen was a table, and beside the table there were three chairs. The first was a great big chair, the second was a middle-sized chair, and the third was a tiny wee chair.

One day the three bears went out for a walk. Before they started Mother Bear prepared the dinner, and poured it into three basins.

While they were out a little girl named Goldilocks passed by that way, and looked in at the window. The food in the basins looked very tempting, so she pushed open the door and walked in.

GOLDILOCKS DISCOVERED BY THE THREE BEARS

She sat down in the great big chair, but it was much too large for her. So she tried the middle-sized chair, but that was not high enough ; so she sat down in the tiny wee chair, which just fitted her.

She took up the spoon and soon ate up all the little baby bear's dinner.

When she had finished she began to feel very tired, and thought she would like to lie down. So she went upstairs into the bedroom, where she found three beds. The first was a great big bed, the second was a middle-sized bed, and the third was a tiny wee bed. First she tried the big bed, but it was much too big. So she got out again and tried the middle-sized bed. But *that* was too big, so she jumped into the tiny wee bed and at once fell fast asleep.

Soon the bears came back, and they went straight up to the table.

" Someone's been sitting in my chair," cried the great big bear in a great big voice.

" Someone's been sitting in my chair," cried the middle-sized bear in a middle-sized voice.

" And someone's been sitting in *my* chair," cried the tiny wee bear in a tiny wee voice.

Then they looked into their basins.

" Someone's been tasting my dinner," cried out the great big bear in a great big voice.

" Somebody's been tasting my dinner," cried the middle-sized bear in a middle-sized voice, looking very indignant.

" And somebody's been tasting *my* dinner and eaten it all up," cried the tiny wee bear in a tiny wee voice.

" Who is it ? " cried all the bears together. And they all ran upstairs.

The great big bear ran in a great hurry to the great big bed.

" Somebody's been lying in my bed," he cried.

The middle-sized bear ran to the middle-sized bed.

" Somebody's been lying in my bed," she cried.

And the tiny wee bear called out in a tiny wee voice :

" And somebody's been lying in *my* bed—and, oh, here she is ! "

Just then Goldilocks woke up. She was so frightened that she ran out of the house, and they never saw her again.

THE COBBLER AND THE ELVES

HANS STUMPIE was a cobbler who lived with his wife in the Forest of Thuringia, in Germany, where all the countryfolk wore wooden shoes.

As Hans made only leather shoes he had a hard task to get a living. Things went from bad to worse, and at last he had nothing left in the house but a bit of leather scarcely large enough to make one pair of shoes. Hans cut the leather out very carefully, and went to bed.

When he came down in the morning—oh, wonder of wonders!—there, on the board, were the shoes already made. And a customer came in and bought them at a good price, and with the money Hans got some food and also purchased a larger piece of leather. He cut this out into the stuff for two pairs of shoes, and in the morning he found the two pairs made, and he sold them in the course of the day.

Then he purchased leather enough for four pairs of shoes, and cut them out, and in the morning there were four pairs made. So it went on. No matter how many pairs he cut out overnight, they were all made for him the next day. And the end of it all was that he became a very prosperous man.

Just before Christmas Hans and his wife sat up to see who it was who made the shoes, and at midnight in jumped two wee men. They at once squatted down on the board and took up the pieces of leather, and sewed away so quickly that Hans and his wife could not follow the movements of their hands. When all the work was done the two wee men went quietly away.

The next morning Hans's wife said: "Now that the two wee men have made us rich we must do something for them. I have it! I will make them some clothes, and you must make them some shoes."

So the next night Hans and his wife put the clothes and shoes on the board for the little creatures, and watched to see what they would do. The two wee men were at first astonished to find that no leather had been cut for them to work on. Then they saw the clothes and shoes, and put them on, and danced merrily about the room, singing:

Neat and natty boys are we;
Cobbler's elves no more we'll be.

They hopped over the chairs, they hopped over the tables, and at last they hopped out of the window, and they never came back. But Hans always prospered in his work, and he and his wife lived in ease and happiness all the rest of their lives.

HOW GOTHAM GOT A BAD NAME

EVERYBODY has heard of the Wise Fools of Gotham. But perhaps we do not know who these men were, or where Gotham is, or exactly what is meant by calling them "Wise Fools." This is the story.

Gotham is a village in Nottinghamshire, and one day his Majesty King John of England, marching toward the town of Nottingham, commanded that his retinue should pass through Gotham meadow.

Now, it was popularly thought that any land over which the King passed became ever after a public road; so the men of Gotham, who valued their meadow, took steps to prevent King John from crossing that way. The King, angered by their proceedings, sent his officers to conduct an inquiry in the village.

When the officers arrived they found some of the men shouting and making a tremendous din over a pond. These noisy fellows had an eel on a string, and were trying, so they said, *to drown it in the pond!* Others were found rolling cheeses down the road, giving them a push and letting them bowl along of their own accord. They were sending their cheeses, they said, to Nottingham market. Others, in a tremendous hurry, were dragging carts and wagons up a hill. They were going to shade a wood, they said, from the hot rays of the Sun. And others were building a hedge round a bush on which a cuckoo had settled to prevent the bird from flying away.

The officers went away half-amused and half-disgusted, and reported that Gotham was a village of fools utterly beneath the King's notice.

But others, who knew more of the story, said that there were some very wise fools in Gotham, and so the phrase came to signify folly which was assumed for a wise purpose. It was really a compliment to Gotham, not a sneer.

A charming old English writer, named Thomas Fuller, says: "Gotham doth breed as *wise* people as any which causelessly laugh at the simplicity."

Nature's Wonderful Living Family in Earth and Air and Sea

Eskimo dogs, from the fine copyright painting by Miss Maud Earl of "The End of the Trail"

THE FRIENDLY DOGS

It was an important day for the human race when one of the wild men of old went into the wilderness, captured a creature with twice as many legs as his own and twice the speed that he could command, tamed and trained it, and so started an everlasting partnership between mankind and the brutes.

Man lived by tracking, trapping, and killing. In the wolf or the jackal, which was to become his dog, he found a fresh and notable addition to his powers. The friendly dog became new ears, new nose, new eyes to him, and so doubled and trebled the forces which discovered and led him to his quarry.

Moreover, we know from primitive peoples still living after the fashion of our ancestors that the dog early became a living weight-shifting power. The Eskimos with their teams of sledge-dogs, the Tibetans with their caravans of dogs crossing the mountains with packs of merchandise on their backs, mirror for us the ways and works of primeval man who moved loads of dog-drawn property when wheels were as unknown to them as they are to the Laplanders today.

By a sort of free and easy enslavement of an animal early man began his own emancipation from the level of the beasts. He became an owner for the first time, with duties and responsibilities to dumb creatures. The need to keep his ally healthy and vigorous for the chase and for hauling made man think, made him considerate and kind in a rough way to animals. Care for brutes helped to humanise the untutored savage who won the affection of the first of dogs.

Which was the first dog? It was none of the species that we now know as wild dogs. Differences of structure show us at once that it was none of these. And certainly it was not the fox. There remain the wolf and jackal. They are the source from which every dog we have comes to us.

It may be that we have dogs tracing back entirely to wolves, and dogs tracing back entirely to jackals. The Eskimo dog is practically pure wolf; so is the wolf dog of Florida; and the line of descent of the Alsatian wolf dog is clear. Dogs owned by Red Indians are scarcely to be distinguished from the coyotes of the prairies, but the dogs of South-Eastern Europe seem only tamed jackals.

The probability is that the blood of wolf and jackal mingles in most of our fashionable breeds of dogs, and that only the tamed animals of savages and semi-wild peoples remain full-blooded modifications of wolf in one area, of jackal in

another. There is no strain of alien life in our dogs. Wolf and jackal have yielded us all we have.

The tiny pet of the boudoir, spoiled by unnatural luxuries; the giant mastiff or St. Bernard which lords it over a patrician courtyard; the dog which guards the poultry or the flocks, which saves us from drowning in rough seas, or keeps the burglar from the house—they are all the posterity of wild hunting beasts that tore other creatures to pieces or gorged with ecstasy on the carrion fouling the ways over which their keen noses led them.

TWO HUNDRED BREEDS OF DOGS FROM ONE OR TWO ORIGINAL STOCKS

With this limited store to draw upon, man has done marvels. We know how many breeds of pigeons have been evolved from the single parent stock, the wild rock pigeon, and how many varieties of poultry have been created from the wild jungle fowl; but the man who has studied dogs by careful selection has evolved nearly 200 breeds from one or two original stocks.

Perhaps the dog most loathed of all dogs is the semi-wild Australian dingo, the dog that does for our kinsmen's sheep what the rabbit did for his pastures. It has always been regarded as a modern introduction into the Island Continent, the only highly developed flesh-eater in a vast land where all other animal life has remained at the stage to which it had advanced throughout the world hundreds of thousands of years ago, but a dazzling discovery has revealed the dingo as an ancient aristocrat of Australia! In 1884, fossilised remains were found, washed out by a flood from their age-old grave, seven or eight feet below the surface of the ground, at Talgai, on the Darling Downs of South Queensland.

THE PRICE ON THE HEAD OF EVERY DINGO IN AUSTRALIA

Man and these creatures lived together in Australia so long ago that we cannot even guess the time that has since elapsed. We can only put the time in geological language, and say that the period was when Britain was covered with ice. Professor Wood Jones of Adelaide University believes that between that far-away expedition and modern times no man reached the Australian mainland until Captain Cook visited it. We cannot but feel that man dared not have ventured into that mysterious land of extraordinary animals without his fearless dingo.

For ages he has been free in Australia, living upon small game and doing no harm. But white men arrived and brought sheep, and the sheep multiplied. They proved easy prey and good food for poor dingo.

Dingos, receiving a new impetus from this fresh source of nourishment, have increased as fast as the sheep, and have become the chief foe of the flocks in the land which their far-away ancestors sailed to seek and guard. Today there is a price on every dingo's head.

That is ever the case when tame dogs run wild. In England they kill sheep; abroad they rival the jackals as scavengers and thieves, or, in the vicinity of wolves, take up the life and liberty of those dreaded animals. Left to themselves all the pets of our homes today would become as wild as the dingo, and as destructive.

THE MANY QUALITIES WE FIND IN ALL KINDS OF DOGS

There is no danger of this happening in civilisation where the dog stands first of all animals in our affections. The tendency is to increase the number of the breeds. This is easily done by preserving those of distinctive shapes, sizes, markings, type of coat, and so on.

The result is that we have fashions in dogs as in clothes and shapes of motor-cars. The favourites of the day are soon neglected. Today's favourites may be the Alsatians among big dogs, the Pekins among small ones, the Bedlington and Sealyham among small sporting dogs. Formerly we had tiny Schipperkes, pugs, poodles, Dalmatians, various minute spaniels, and all sorts of little terriers. Tomorrow a new variety will arise, like a new flower or a new fruit, to become the rage.

All sorts of qualities are treasured from time to time—speed and staying power, indolence and placid home-contentment; ferocity and strength for fighting; gentleness and fidelity for the boudoir. The one thing that men have never sought to breed in dogs is intelligence.

In spite of this the dog brain is a fine natural instrument. Which is the most intelligent dog in the world? That is known to every one of us who loves a dog: the most intelligent dog in the whole, wide world is our own!

A KENNEL-FULL OF DOGS

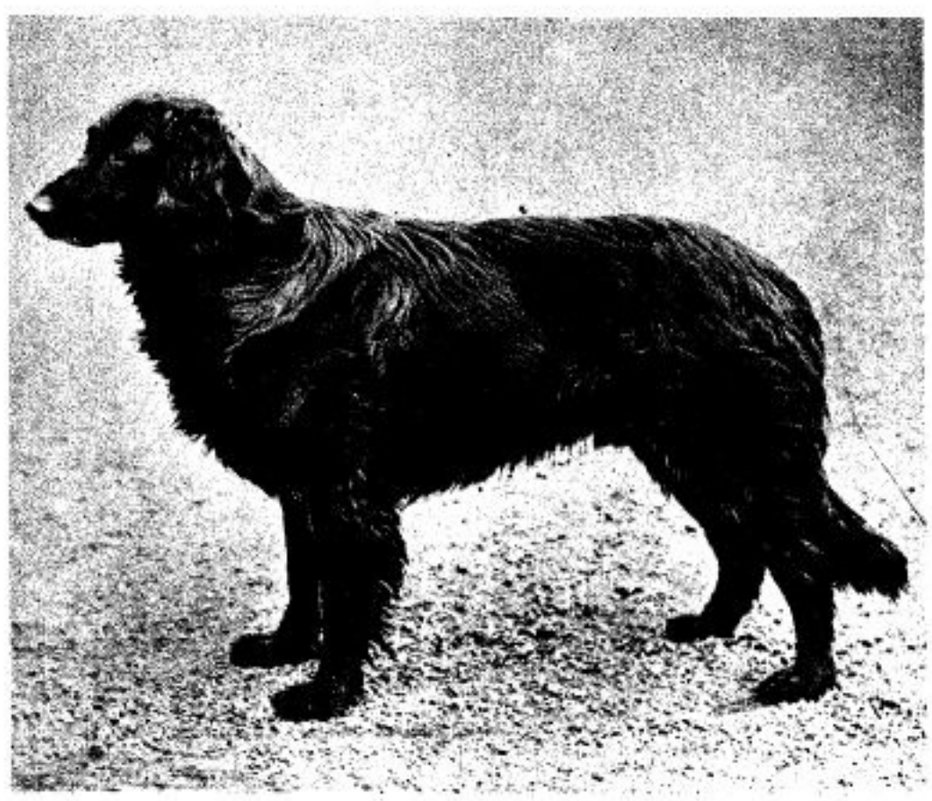
FRENCH POODLE

IRISH WATER SPANIEL

MASTIFF

NEWFOUNDLAND

BLOODHOUND

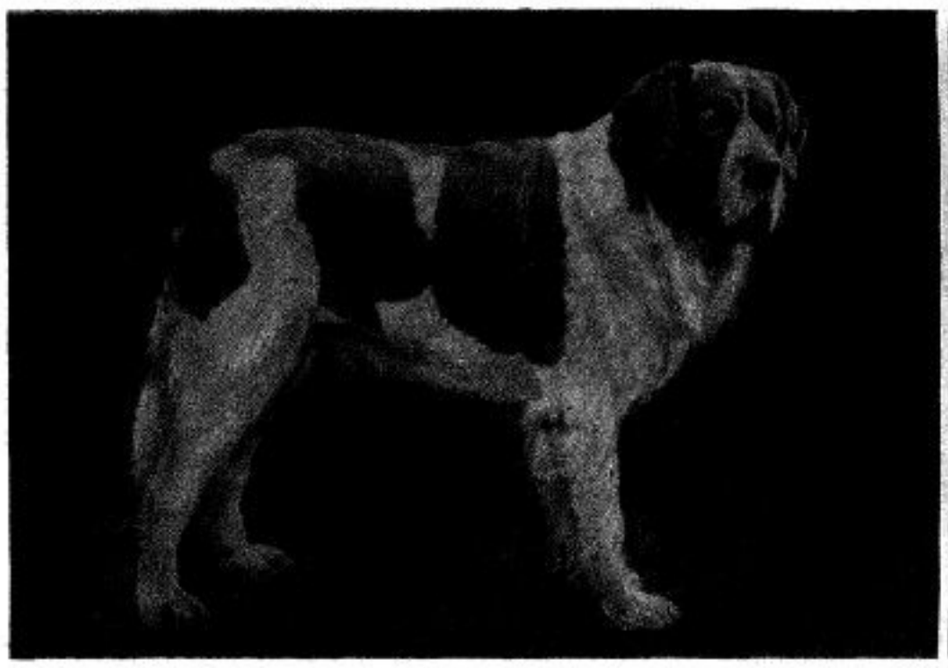


RETRIEVER

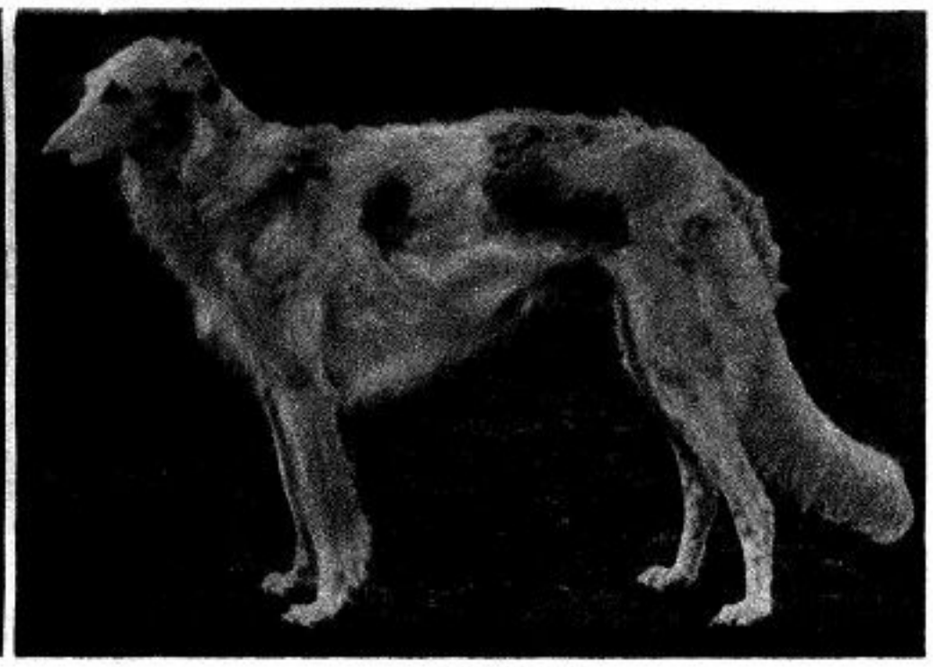
TOY POMERANIAN

BULLDOG

PRINCE CHARLES SPANIEL



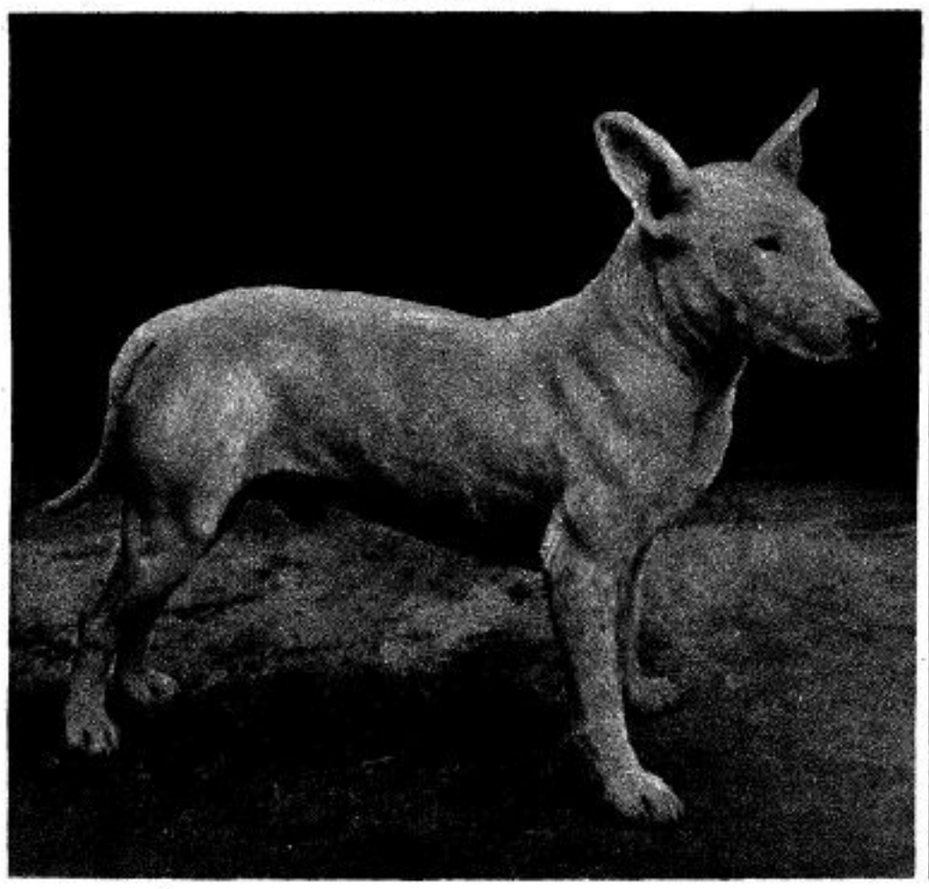
ST. BERNARD



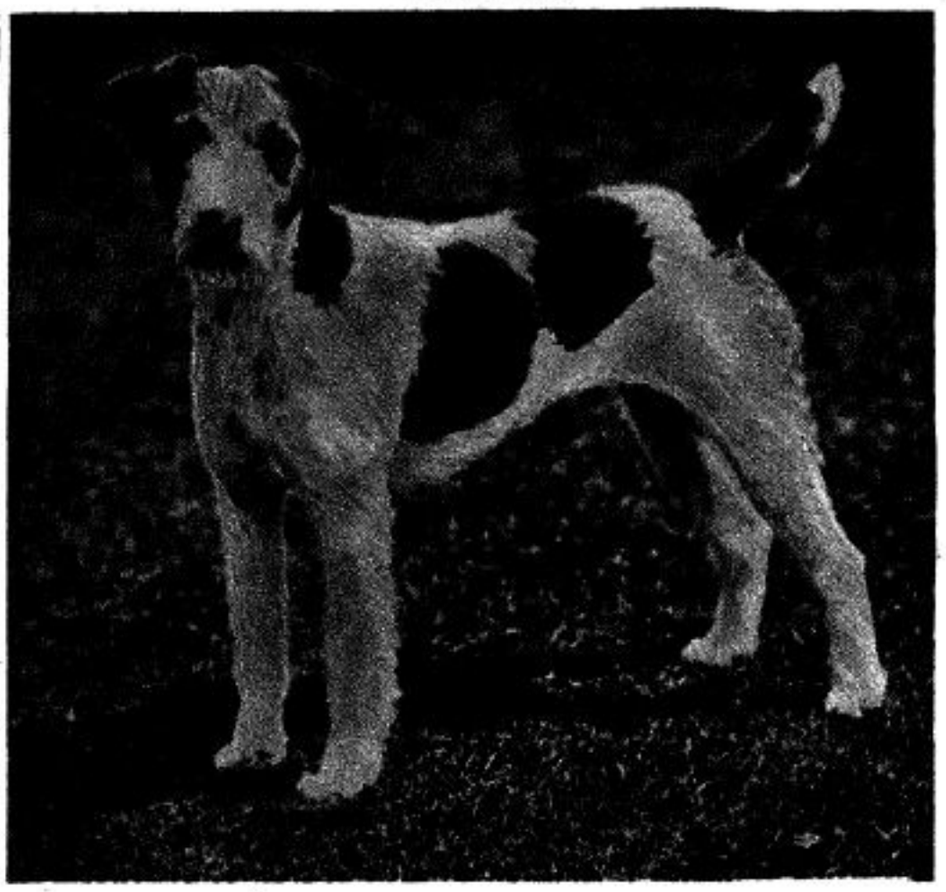
BORZOI

SETTER

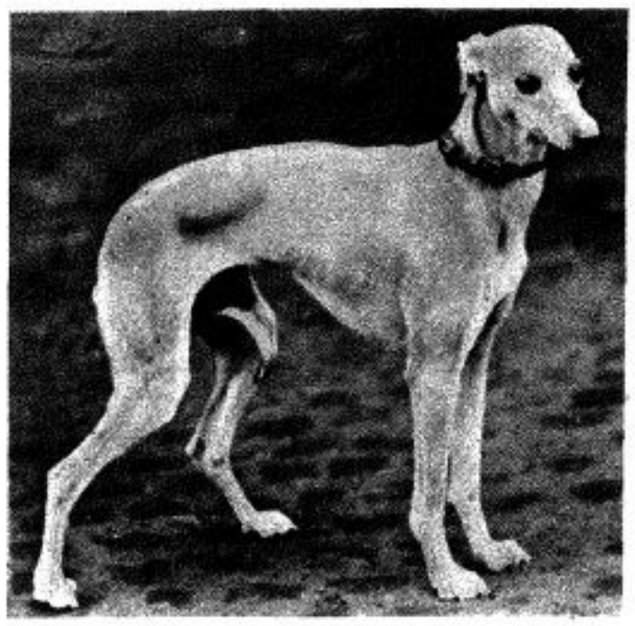
POINTER



BULL TERRIER



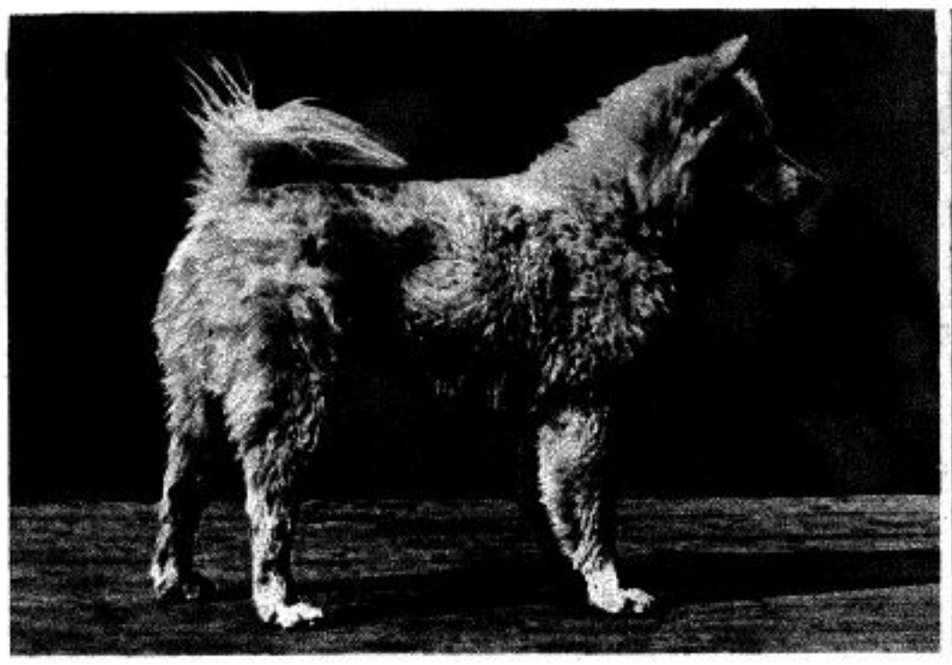
WIRE-HAIRED FOX TERRIER



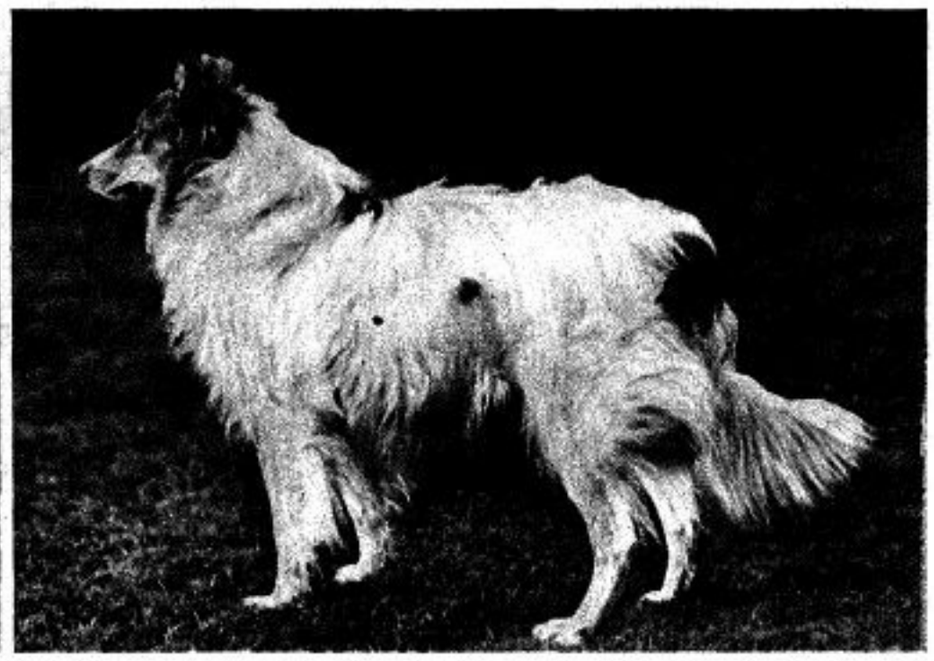
WHIPPET

PUG-DOG

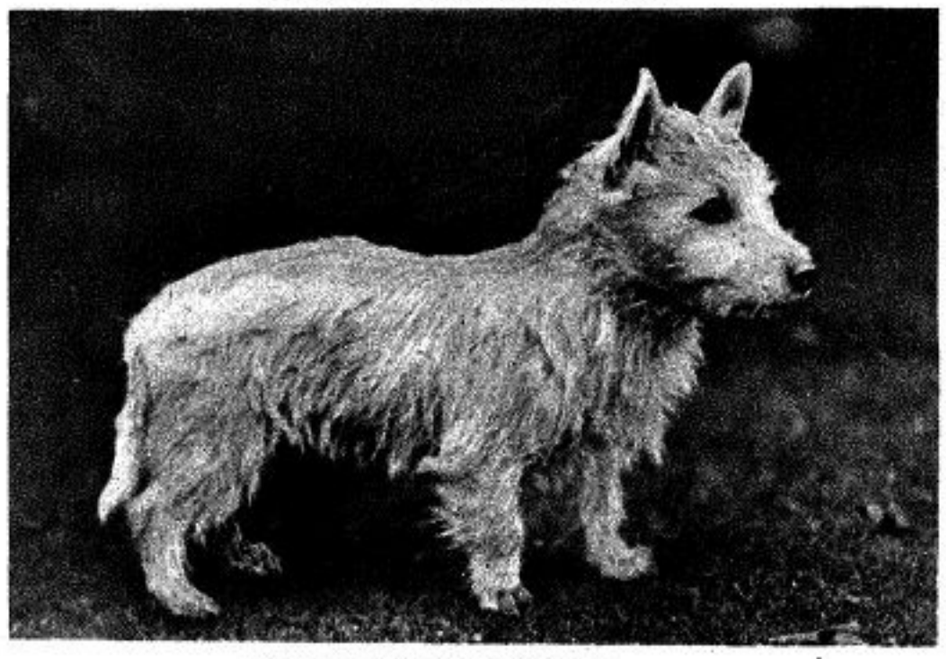
GREYHOUND



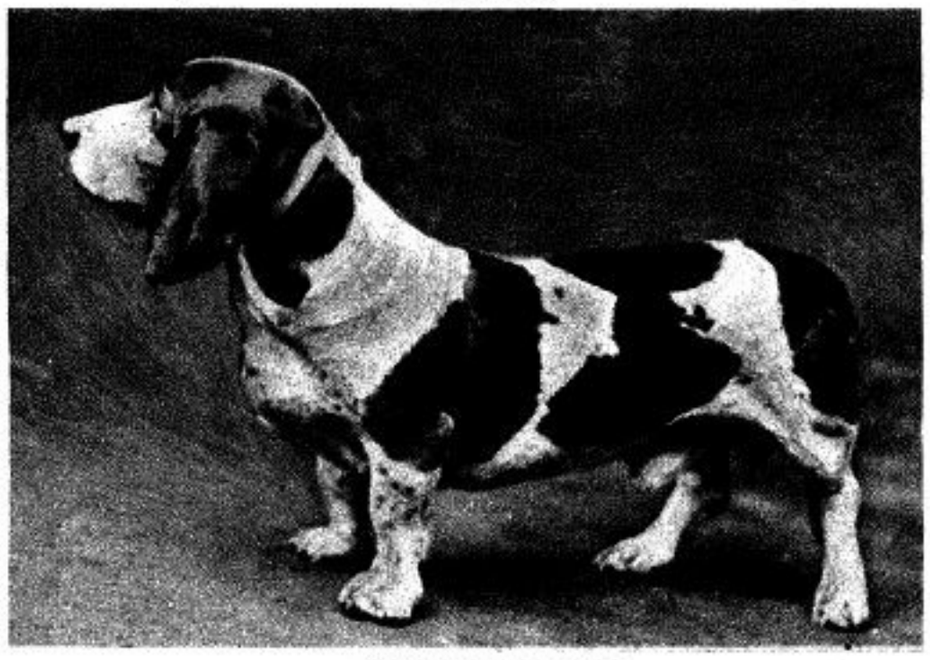
WHITE CHOW-CHOW



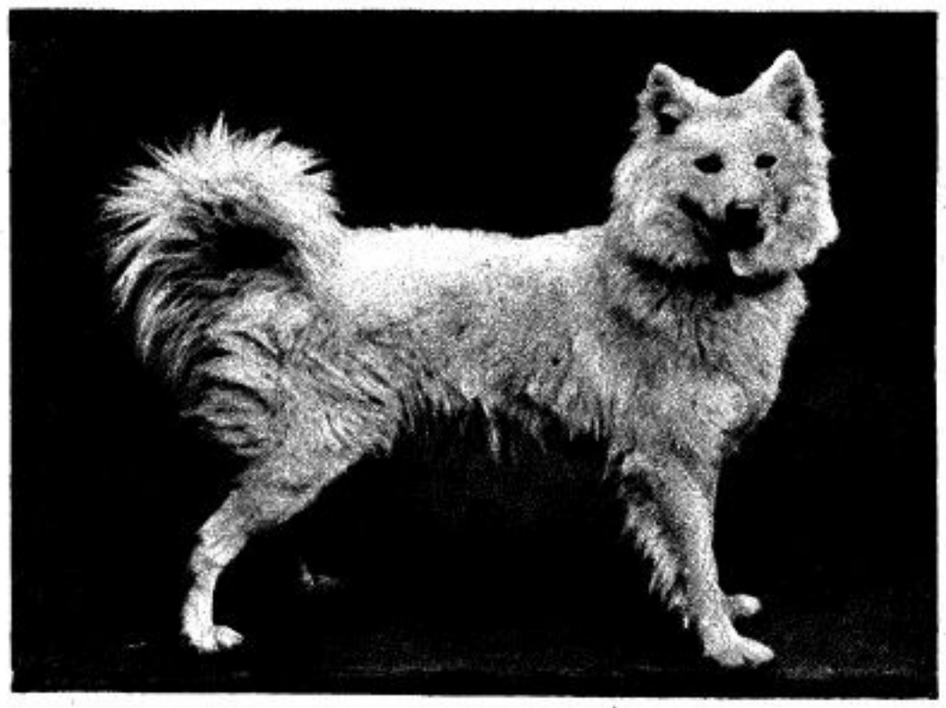
COLLIE



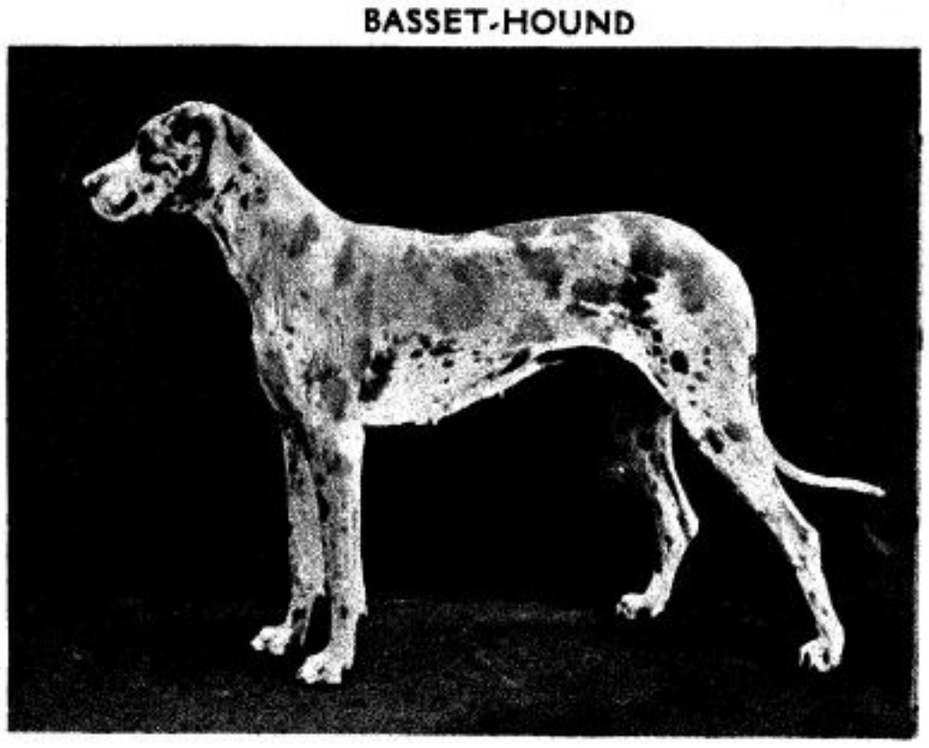
HIGHLAND TERRIER



BASSET-HOUND



SAMOYEDE



GREAT DANE

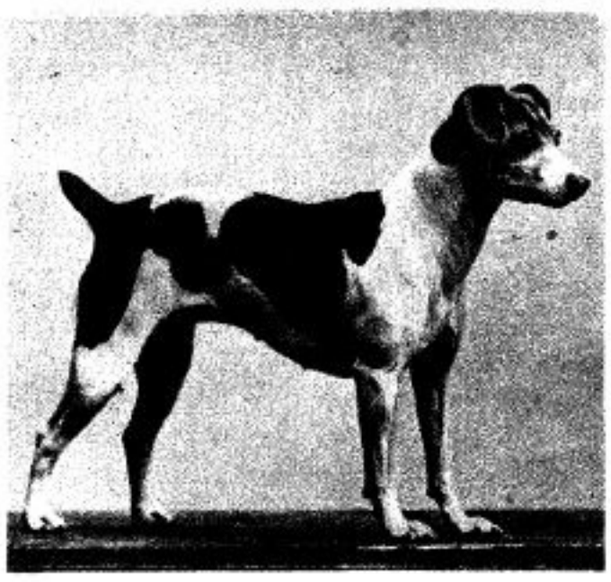
AIREDALE

BOARHOUND

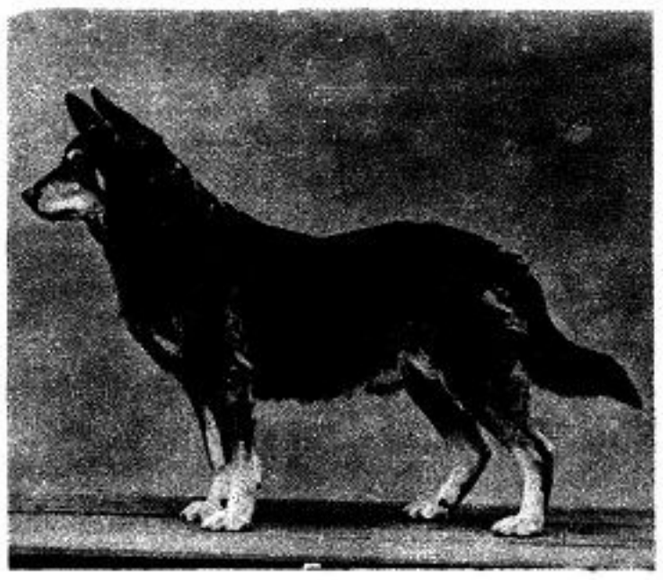
FIELD SPANIEL

KERRY BLUE TERRIER

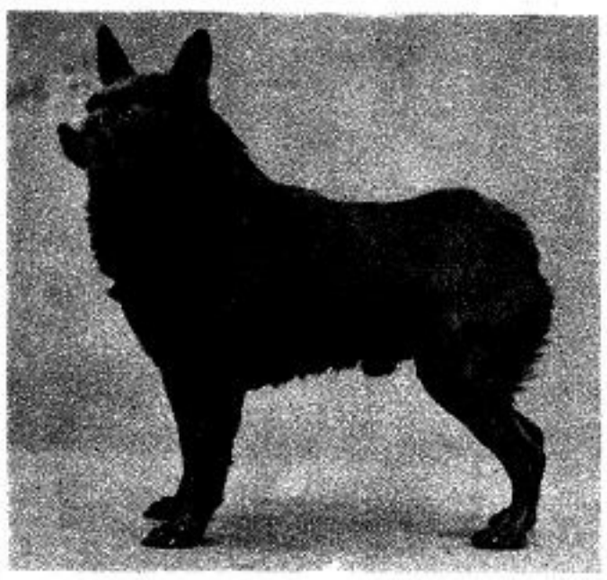
SCOTCH TERRIER



SMOOTH-HAIRED FOX TERRIER



NORWEGIAN SLEDGE DOG



DUTCH TAIL-LESS DOG

SKYE TERRIER

SHEEP DOG

DACHSHUND

ALSATIAN WOLFHOUND

YORKSHIRE TERRIER

PEKINGESE

SIBERIAN SLEDGE DOG

DEERHOUND

FOXHOUND

DANDIE DINMONT

DALMATIAN

Scientists quarrel as to whether the dog has any reasoning powers. Let them quarrel. All of us who have grown up with dogs, have been taken out as children and led about by them, who have been saved from injuries and from drowning by them, have been tricked and deceived by their cleverness, have been loved and worshipped and benefited by them—we feel that we know.

Whatever we call it, dogs have a mental quality that enables them to do things that no quite unreasoning animal could do.

Think of those two terriers belonging to Mr. Frederick Nutt, the bookseller of Clement's Inn, London, which, accustomed to play about the entrance to King's College Hospital when it was in the Strand, saw a strange collie run over in the road, assisted it to the hospital door, and barked until they were all let in for the sufferer to be treated by the doctors.

SOMETHING AKIN TO REASON AT WORK IN THE DOG'S BRAIN

How are we to account for that? Mr. Nutt gave his opinion to the present writer in these words: "The dogs were accustomed to see injured patients carried into the hospital. They themselves never went in, but they somehow grasped the meaning of those visits by injured people on stretchers, and, by some unfathomable process of thought, when they saw a stranger of their own kind also in distress, they led him to the help which they realised others received at the hospital."

The explanation is not scientific; it may be full of flaws, but science has none more plausible to offer. The incident is commemorated in an oil pointing hanging in the hospital board room; and doubtless the Governors would not scorn the theory built up by the owner of the two delightful terriers that are the heroes of the picture.

When we see a dog who wants the chair in which its master sits run to the door as if to get out, and then, when its master gets up to open the door, rush back and seize the empty chair with delighted barks, we feel that something akin to reason must be at work in that little brain.

When we see the marvels that are performed by dogs in shepherding sheep—turning so many to the left, and so many to the right, driving them gently round obstacles, penning them, letting them out, identifying one familiar sheep and bringing it out from a flock of strangers—we know that training has made the wonder possible. But what are we to say of the animal mind capable of such an education?

SIX GROUPS OF DOGS FROM WHICH ALL THE REST HAVE SPRUNG

Intelligence and ability to receive instruction have made dogs the friends of man. If only they had been bred for intelligence! They have not, so let us glance rapidly at some of the results of the practices that have for ages been followed. The result has been to fix six groups of dogs from which all the rest have sprung. These are they: Wolf-like dogs, greyhounds, spaniels, hounds, mastiffs, terriers.

Some of the relationships are a little surprising. The Eskimo dogs, which draw the sleighs, like the lusty little heroes which take the mail to snowy Alaska, are obviously more or less polite wolves; but it is startling to know that the big Pomeranians, wolf-hunters in old-time Germany, come next, with the tiny Poms of the drawing-room as their smaller brethren. And in the same group come the delightful Schipperkes, owning as close kindred the handsome, but rather sharp-tempered, Chow-chow of China.

What a range of life that covers: a handful of fish or offal, a piece of stolen harness, or the body of a dead comrade is the meal of the wolf-like Eskimo dog, which took Amundsen to the South Pole and Peary to the North Pole. At the other end of the line are the spoilt Poms for whom no food is too dainty. The hard-working, handsome collies and sheep dogs are in the same collection—all sons of wolves, as far as we know.

THE RUSSIAN BORZOI THAT WILL TACKLE A STOUT WOLF

The greyhounds, fleetest of dogs and among the least intelligent, are unique not only for their speed, but for hunting by sight. Ordinarily dogs track by scent. Not so these specialised speed machines. They are the result of intensive breeding, they and their Italian whippet cousins.

Related to them is the Scottish deerhound, stouter and coarser of hair; the ancient Slughi of Persia, the long-haired Afghan greyhound; and distinct breeds from Greece, Albania, and elsewhere. Next comes that beauty, the Russian borzoi, over 30 inches at the shoulder and a match for a stout wolf. It was dogs from the breeds in the present group which

figured in the life of the Pharaohs and were carved upon Egyptian monuments.

Merely noting the existence of unpleasant hairless freaks from China, Central and South America, and sometimes seen in England, we pass to the Spaniels, of which the famous ones are The Clumber, the Sussex, the Norfolk, and the little Cocker Spaniels. The King Charles and Blenheim Spaniels are small varieties of the Cocker breed.

The normal Spaniels all have some taste for the sports of man, and will find game and pick it up when it has been shot. But the little Pekingese, which are Eastern spaniels, do not share the common avidity of the breed. How should they, after generations of scented sanctuary and foolish pampering?

Setters, which find game, and then stand rigid over it, are specialised spaniels. The retriever, fine in the water as well as on land, is also a spaniel, and so is the noble Newfoundland. The Newfoundland is without comparison, as a breed, as the saviour of lives in the water, but one has known an untrained curly retriever just as brilliant, clever, and courageous as a water-dog as any Newfoundland.

THE HOUNDS THAT USED TO TRACK DOWN MEN

Next come the hounds, with the bloodhounds at their head. They have lost their place, we are thankful to say, as trackers of men. Once they did track, and tore when they found their man. That quality has been bred away, and the modern bloodhound fawns with delight upon the person whom it is set to find.

The feats of the bloodhound result from fineness of nose; but it is doubtful if its scent much excels that of its kindred, the foxhounds, which hunt the fox entirely by a scent that soon evaporates. Harriers and beagles, which hunt hares and rabbits, have the same faculty; and otter hounds have keen noses, as well as woolly coats to keep out water when pursuing their quarry.

Dachshunds, big and little, are badger-hunting dogs at home in their native Germany and are keen of scent. Our pointers also are famous for their noses, but instead of following the trail left by the feet of the quarry, as the foxhound does, they detect victims by body scent, which rises higher in the air. The old "plum pudding" Dalmatians, now nearly extinct, are hounds, and so are the uncommon Griffons.

Mastiffs include not only mastiffs proper, but the Great Dane or German boarhound —biggest of all the dog tribe except the Alaskan wolf. One of the true mastiffs is English bred; another is a Cuban variety.

In this breed come the bulldogs, now a declining race. Ours were bred to fight bulls and other animals, and fortunately their occupation is gone. So, nearly, are the dogs, both bulldogs and bull-terriers—rather stupid animals—whether English or French, though with brilliant exceptions. A nice, ugly bulldog can be the most lovable of creatures, but there are others which are not so friendly.

THE GALAXY OF TERRIERS THAT WE HAVE TO CHOOSE FROM

Two of the finest dogs, the huge wolf-fighting Tibetan dog, which guards the native villages, and the noble St. Bernard, long the hero of rescues of lost wanderers in the snowy Alps, all but complete the mastiff group. The plump and gasping pug is also a mastiff, little and freakish.

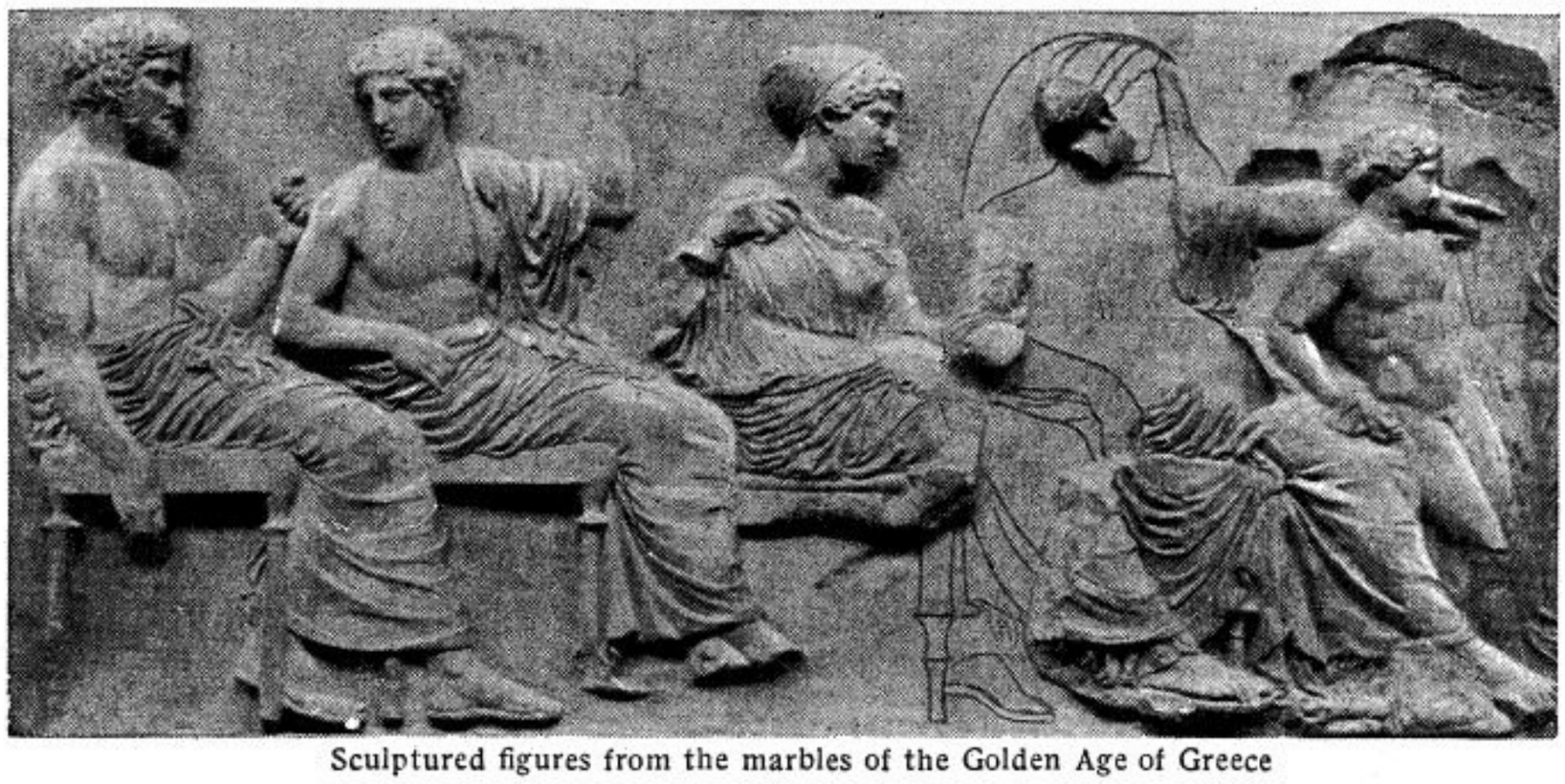
The terriers remain, very near to our hearts, some of them, whether they guard us from rats and mice, or share our walks and hunts, become partners of the study and dining-room, or remain faithful at their posts, kennelled, but not chained, we hope, in the garden.

No one need lack a favourite with such a galaxy to choose from: fox terriers smooth and rough, Irish, Scotch, Skye terrier with drop ears and smooth coat, Skye terrier with prick ears and rough coat, the Yorkshire terrier with hair three or four inches long on the body, the little Griffons, the black and tans, the various tiny toy terriers, the very clever poodle, the sturdy Airedale, the Maltese, the Mexican lapdog, and so on—a breed for everyone.

The newest is peculiar to Africa, the Rhodesian lion-hound, a dog with a great protective mane, bred solely to do battle with the lion.

THE GOLD OF AFFECTION THAT OUR DOGS NEVER LOSE

There is something to admire and grow fond of in each. Every dog has its faults and commits its follies, but when did ever one betray its master or mistress? When did the affections of one ever grow cold? We have done much for and with dogs, but they brought in with them from the wilds a nature whose savagery was redeemed by a vein of pure gold. And the native gold is the one thing that science and artifice have never bred out of them.



Sculptured figures from the marbles of the Golden Age of Greece

A NEW BIRTH FOR MANKIND

WHILE the wonderful Egyptians were building their temples to Osiris, and while the Hebrews were lifting up their voices in hymns of exquisite loveliness to the one true God of Righteousness, a race of people, to whom history had paid little attention hitherto, was taking a step into the future destined to change the whole face of human existence.

These people, the Ionians, were Greeks; and Greece at that time was a country of scattered villages and little primitive townships, both inhabited by people whose main interest in life was concerned with agriculture. They were constantly at war and most of their traditions were concerned with war, yet on the whole they were a peaceful peasant people, and their wars were marked with a touch of chivalry.

Few people stop to think about two extraordinary features in the great war poems of Homer. He never once abuses the enemy; and he utters the prayer that war may cease. Further, he is quick to seize upon any domestic event which appeals in the midst of war's savage brutalities to the feelings of love and pity. Who can ever forget the incident of Hector taking off his crested helmet to embrace his little son who had turned away frightened by his appearance?

These things should find a permanent lodging in our minds, for they tell us more about Greek character than many volumes of history. They tell us that here was a poor people living seven and six hundred years before the birth of Jesus, who had noble ideas about so horrible a thing as war—though a thing which might well have appeared to them as natural—and who were quick to respond when any appeal was made to those feelings of tenderness and affection which sometimes seem to us the creation of our civilisation.

Less craven and superstitious than the Egyptians, these Greeks were distinguished from all the nations of the Earth by a certain lightness and gaiety of temperament which enabled them to look at life with greater freedom and a keener curiosity than could be found among other peoples.

Very curious is it to reflect that the flash of Greek humour was a light in the darkness of man's earliest struggle with the universe, and a light so lasting that it still illuminates for many scholars a world which sometimes seems plunged in gloom.

How wonderful is it to look back into the heavy darkness of savage times and to see how many centuries rolled over this Earth before there came a *mental* smile to the face of man, and to observe how

that first smile of intelligence was like a flash of daylight.

These Greeks loved their fields, and they made songs and dances to celebrate the seasons of the year. Many of their kings were peasants whose sons were shepherds, and the greatest in the land was not too great for making music with the pipes and joining in the dance of harvest-time. Their little towns were overgrown villages and there they would sing, dance, and make merry ; and out of those pastoral festivals grew the great drama of Greece and the stately architecture which expressed their joy in beauty and their love of making things.

At the same time these Greeks worshipped many gods who were unworthy of respect, and they feared others whose malignity entitled them to be ranked as fiends. For them, as for the savages in other lands, the heavens were filled with beings who had to be pleased or hoodwinked if the vines were to prosper and the goats were to give milk.

THE SHINING SOUL OF NOBLE THALES OF MILETUS

We must think of them as a people standing midway between the darkness of barbarism and the first glittering dawn of civilisation—the most marvellous people yet seen on the Earth, but still trammelled by the superstitious past of mankind.

Some six hundred years before the birth of Jesus there lived in Anatolia, the Land of the Rising Sun, a man called Thales. He lived in Miletus, which was the chief city of Ionia, and the age in which he lived was an age filled with excitement by discoveries made in the East. All the wonders of Babylon and all the marvels of Egypt had become the property of Ionian gossip. Strange tales poured into Miletus of the gods worshipped by these eastern nations, of the mysterious knowledge possessed by their priests, of the splendour of their cities, the glories of their monarchs, and the amazing achievements of their builders.

Thales is one of the greatest men in the history of the human mind because he did not allow his natural excitement in these wonders to overwhelm his intelligence. He listened ; but he reflected. He looked ; but he did not gape. He admired ; but he also criticised.

No priest in Egypt or Babylon could deceive that shining Ionian soul. Thales studied their works, examined their instruments for searching the heavens, and agreed that these priests were wonderful men whose knowledge was surprising indeed ; but he said to himself, " They prove too much by their knowledge."

Then he set out upon a career which has been followed ever since by thousands of the greatest of the sons of Earth, the career of science.

THE NOBLE PHRASE THAT "ALL THINGS ARE FULL OF GODS"

He put all the religions of paganism on one side with the noble phrase, " All things are full of gods," and set himself to study Nature with no preconceived idea from any teaching known among mankind.

It was a superb act. It was the first definite break with superstition. It was the first movement of the human mind toward a fearless pursuit of truth. This citizen of Miletus opened a door for the human race through which we have been able not only to find freedom from the shameful or disfiguring fears of superstition, but to discover in ourselves a power over the forces of Nature of which no king in Babylon, no priest of Isis, can ever have dreamed in his wildest nightmare.

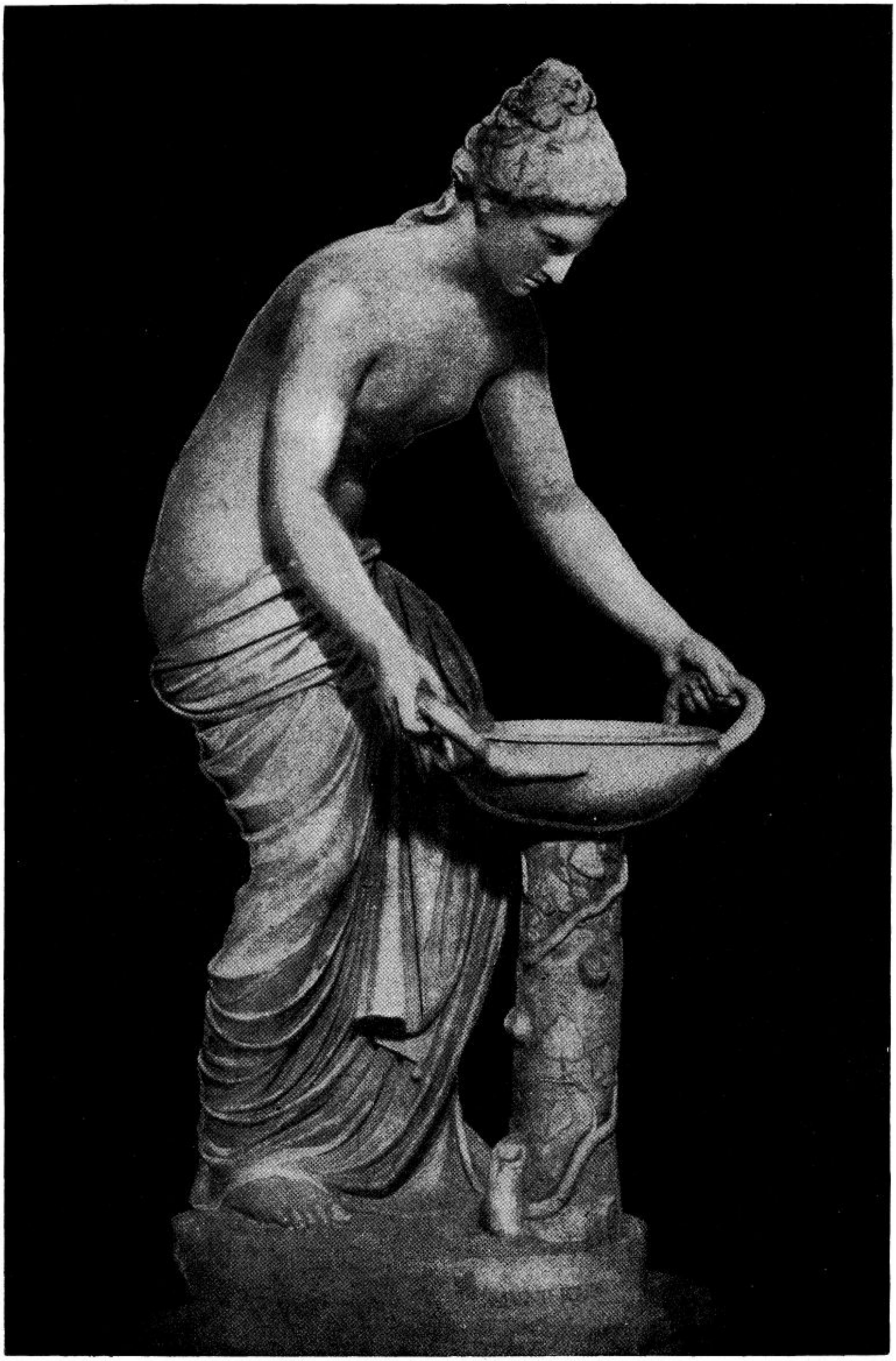
Thales looked at the Oriental's work in mathematics and astronomy, and saw them as human efforts to arrive at truth. He did not say, " These things are revelations from the gods : these things are mysteries before which we must bow our heads in the dust." He said, " These things belong to knowledge." And what do you think he did ? *He predicted the eclipse of 585 B.C.*

THALES WHO THOUGHT ALL THINGS WERE MADE OF WATER

Thales looked at the world about him, at the fields, at the rivers, at the stars, at the hills, and at the sea ; he saw the majesty of Nature's power ; he felt the glory and the beauty of the living world ; but he did not say, " Let us hold our breath, lest the hills fall upon us, or offer sacrifices to the gods lest the sea rise and overwhelm us." He said, " These things belong to knowledge."

Then he said something which has become immortal. He said, " All things are made of water." We laugh at him now for that saying, and many good jokes have been made about it ; but at the time of its utterance it was as revolutionary a saying as the words of Jesus some six hundred

A PIECE OF BEAUTY FROM OLD GREECE



THE LADY WITH THE BOWL

years later, " The sabbath was made for man, not man for the sabbath." It meant a definite breach with the past, and an entirely new attitude to the future. It meant that man had brushed aside as absurdity all the legendary stories of the creation of the world, and had set himself to discover by his reason how things had come to be what they are. Also it meant—and herein lies its essential grandeur, which no ridicule can ever destroy—that in all the marvellous and beautiful variety of Nature there was unity of composition.

THE UNITY OF NATURE AS THALES TAUGHT IT

Think what it must have meant to those primitive sons of the Earth, those men so nearly savage and so deeply pagan, to be told that rock and herb, metal and river, beast and sand, were all made of one and the same thing.

Think, too, that this great utterance in Anatolia was made six hundred years before the time of Jesus. The thought almost staggers us.

It was a mistaken utterance, but never did any truthful utterance work a greater revolution in the history of man's mind. For this dogma of Thales changed the whole current of human thought, and turned the attention of men away from the priest and his sacrifices, away from terror and stupefaction, away from apathy and a soul-destroying indifference, and awakened in them the idea that Nature was a riddle to be read, and a document to be studied without fear. All things were in reality only one thing! Find that one thing, and the whole mystery of the universe is solved! Is it not in this very faith that modern science, twenty-five centuries after the time of Thales, is pressing on to the discovery of truth? Thales said *Water*, today we say *Ether*.

THE SUDDEN APPEARANCE OF MEN AHEAD OF THEIR DAY

Probably we are right; certainly Thales was wrong; but should we now be near to truth if it had not been for the idea of Thales that there is one single thing fundamental to all the manifold wonders of the universe?

How did such a man arise? We cannot answer. From the earliest beginnings of history we find that suddenly and inexplicably there appears on the Earth from time to time some unique figure who seems to leap far forward from his own generation and to know what the mass of mankind will not really know till centuries after his death. And we notice that the appearance of these mysterious beings is always accompanied or followed by some great movement of the human mind—a movement from things that have been toward things which are to come.

We find something of the same sort when we study the evolution of the bodies of animals. We find at certain times sudden great inexplicable leaps forward on quite new lines of development, and these new lines, once started, are permanently continued, directing the development of all succeeding generations.

Thus it was with Thales. There sprang up in Ionia a body of men who regarded the universe as an object of study, and life as a search after truth. A new dignity came into human life. For the sake of truth men were content to forgo all the riches of trade and all the power of politics. And truth was to be sought, not for the sake of terrifying the ignorant and preying on the credulity of the superstitious; but solely for its own sake. It was to be sought in poverty, and by a devotion and self-sacrifice not excelled by the priests of religion. It was to be sought because it was the highest thing the soul of man could ever seek.

THE GREAT DEBT OF CIVILISATION TO THE ANCIENT GREEKS

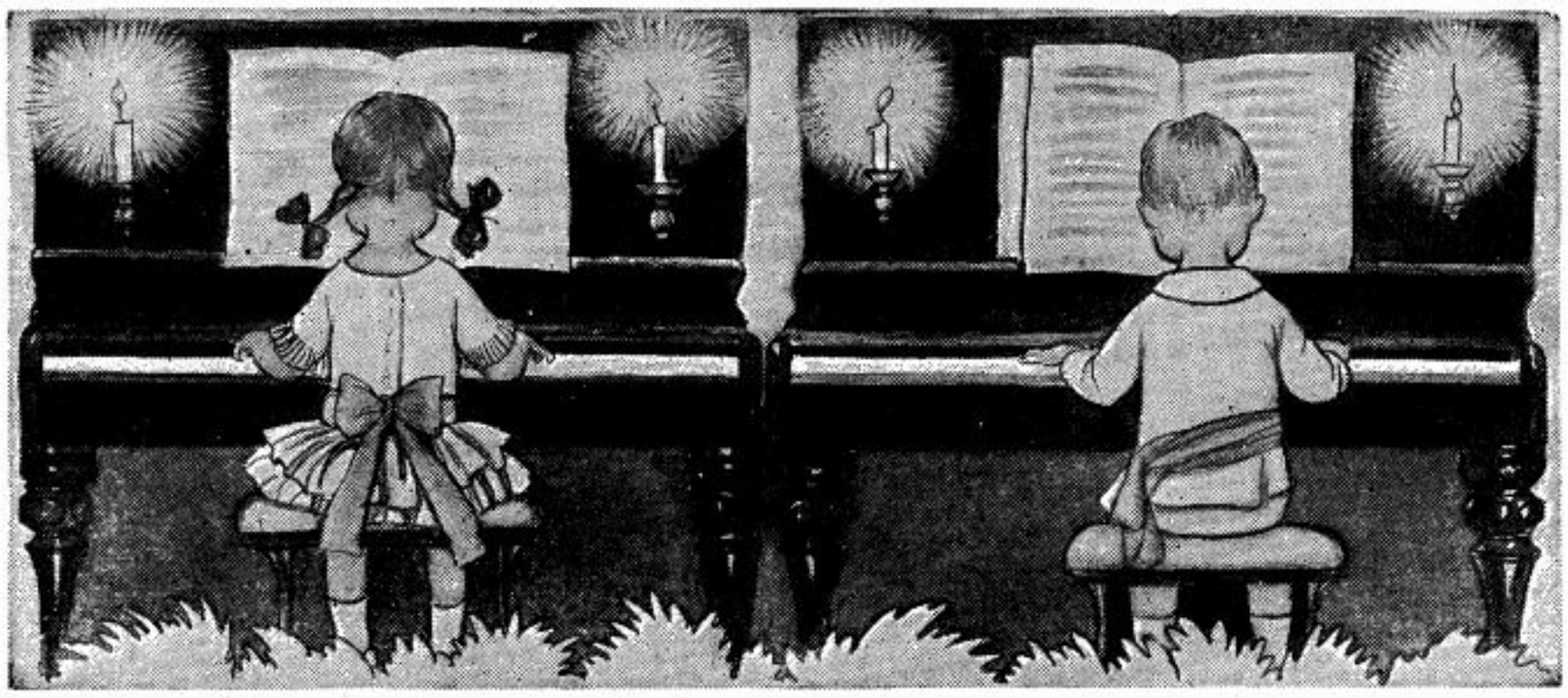
By the work of these few men the mind of mankind was so utterly changed that it does not seem a mere figure of speech to say it was born again. An age of glory came to Greece which has no parallel in the ancient world, and without which it is impossible for us to imagine the subsequent history of the human race. Our English poet Shelley has expressed in a few simple and immortal words the debt of civilisation to those ancient Greeks, and at the same time has given us a true notion of the only glory that endures. The glory of Greece, he says, is

> Based on the crystalline sea
> Of thought and its eternity.

It was by a thought that Greece changed the history of the human race, and because of Greece we now know that the true history of humanity is the history of thought. Thought is eternal.

We shall see in the next chapter—if not, indeed, in every chapter—what great things have come to man from the amazing courage of the first Greek thinkers.

The Story of the Things We See About Us Every Day



HOW WE GOT THE PIANO

WHEN Nebuchadnezzar set up his golden idol on the plain of Dura, the ancestor of the piano was among the instruments at whose sound Shadrach, Meshach, and Abed-nego were ordered to bow.

At what time ye hear the sound of the cornet, flute, harp, sackbut, psaltery, dulcimer, and all kinds of musick, ye shall fall down and worship the golden image.

Two lines of descent may be traced from that formidable orchestra. The psaltery was the parent of the piano-like spinet and its more ambitious successor, the harpsichord. The dulcimer comes down to us in two main streams. In one it is the toy dulcimer of the children's nursery. In the other it is the grand piano !

A musician gifted with prophecy could have predicted both harpsichord and piano from the instruments whose idolatrous overture rang out before the burning fiery furnace.

Psaltery and dulcimer seem generally to have been companion instruments in Eastern orchestras of Bible days. The two instruments were not unlike, but melody was produced from them by two distinct methods.

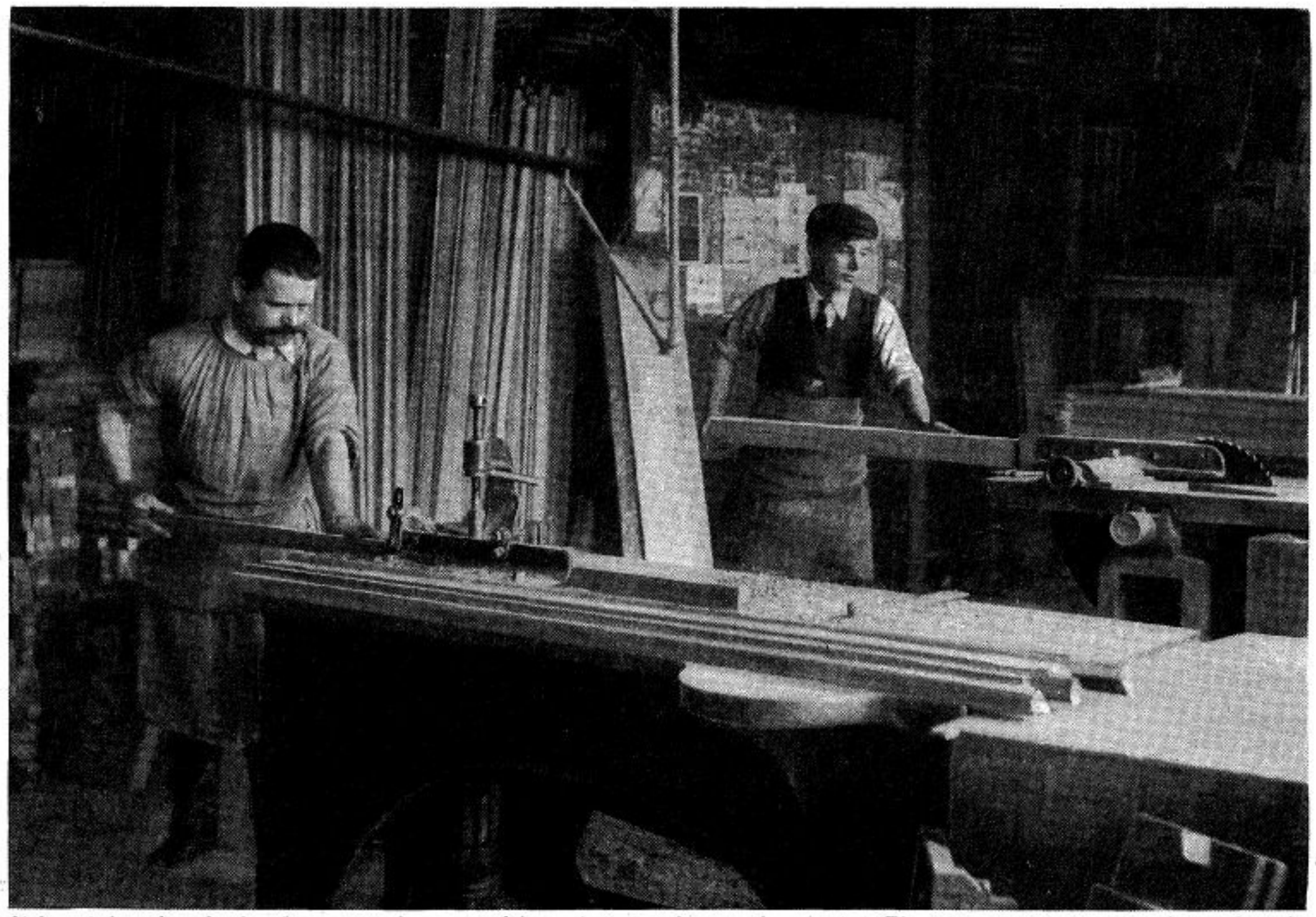
The player of the psaltery drew his fingers across the strings of his instrument, or twanged them with ivory or horn, like the mandoline player. The dulcimer player struck his strings with a little hammer.

There we have the distinction between the spinet and harpsichord on the one hand and the piano on the other. The harpsichord group has wire strings, like the piano. When a key was pressed it caused a lever to rise, having at its summit either a piece of hardened leather, or a quill, or even a piece of brass. The quill was pushed past the string, tugging or jerking it in its passage, so causing it to vibrate and produce its note. The lever, on descending, allowed the quill to pass the wire without a second note. In shape, in the use of wires, of a keyboard, and in other little details, the spinet and harpsichord established a convenient outline for the piano.

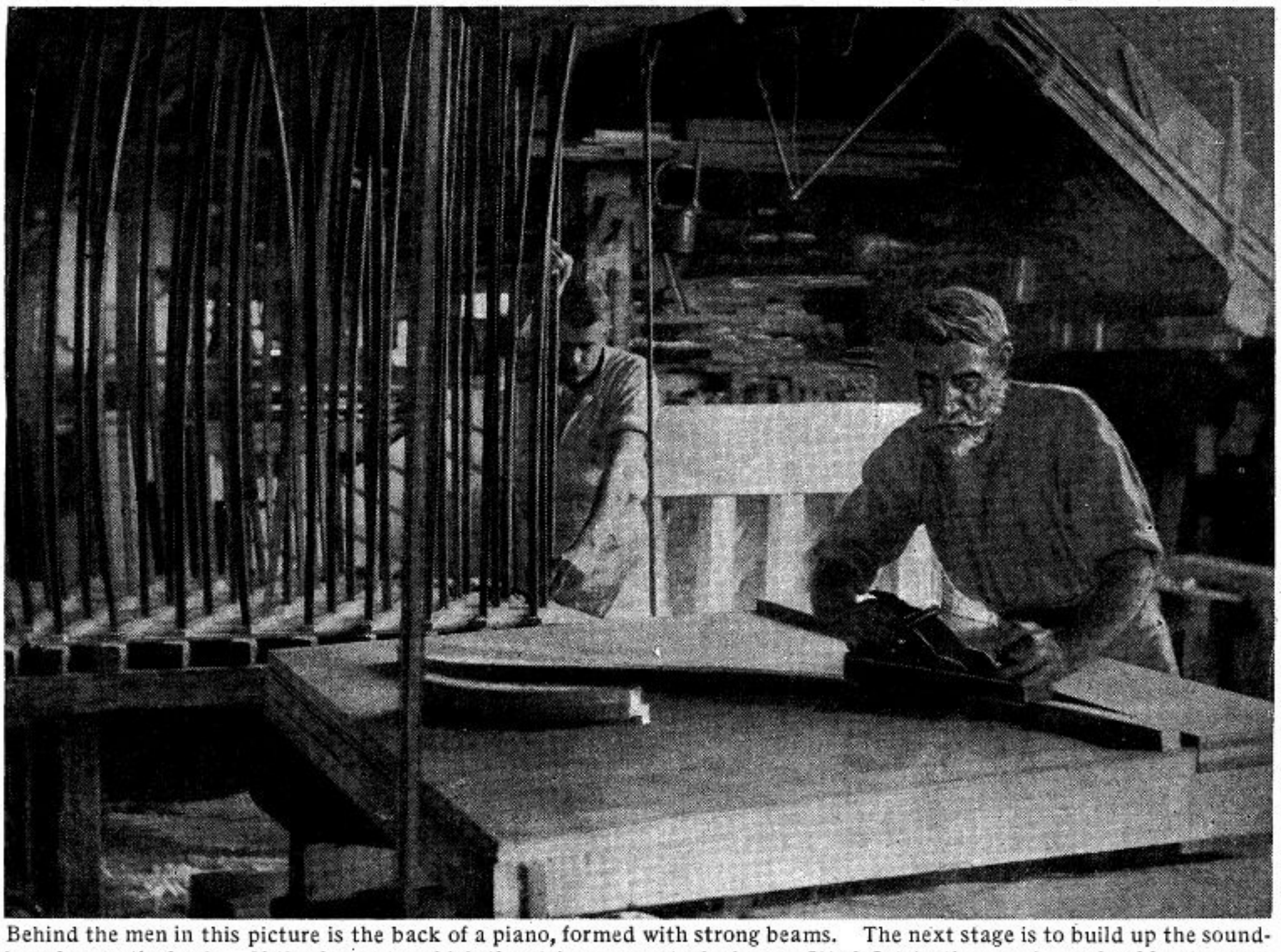
The first piano as we know it seems to have been made in Italy late in the 16th century ; its Italian name, Piano e Forte, means Soft and Loud Its ancestry runs back through Greece and Egypt, Babylon and Assyria, and its ultimate creation was assured when first a man hammered melody out of two sounding materials.

The latest novelty in pianos is one with two keyboards. For this a great future in easy and brilliant playing is predicted. We remember, however, that last century similar hopes were cherished concerning a piano with six keyboards, one above another like those of an organ, but that astounding invention has come to nothing.

PICTURE-STORY OF A PIANO

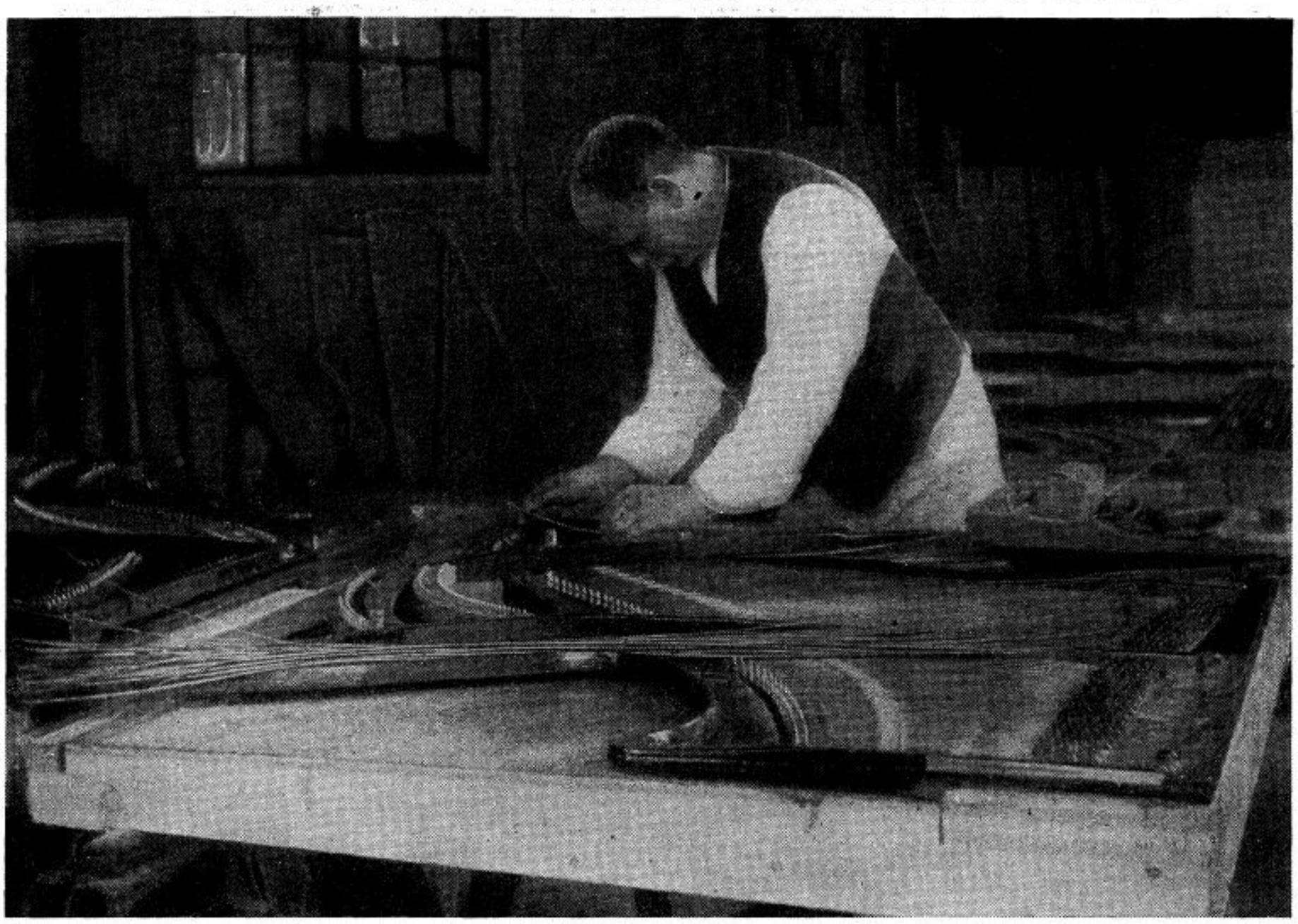


It has taken hundreds of years and scores of inventors to give us the piano. The work is difficult, but is so cleverly done that it seems simple. This is the first step in the making of a modern piano. The wood, which has been carefully chosen and seasoned so that it shall not crack or warp, is here being cut into proper sizes by steam saws.

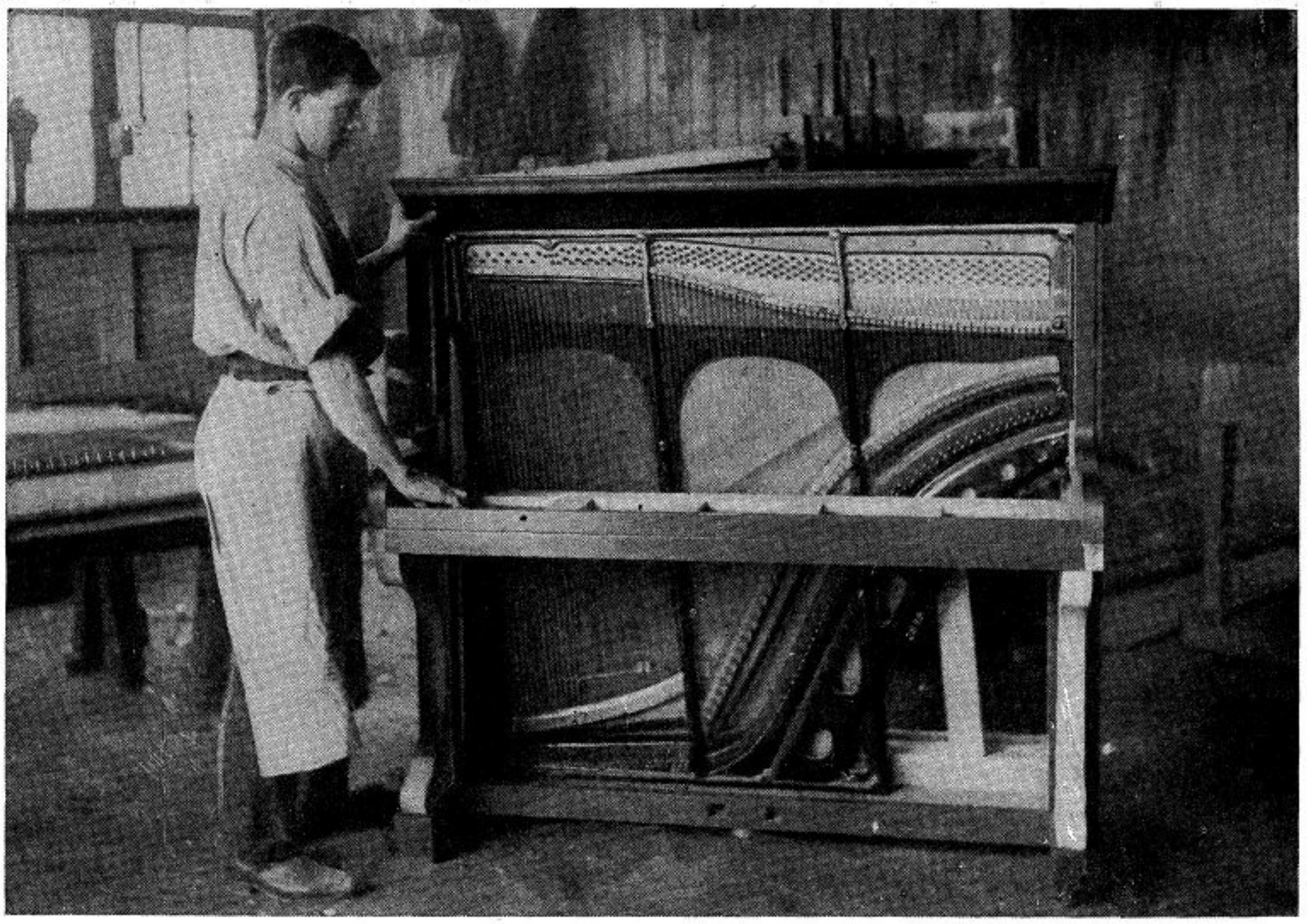


Behind the men in this picture is the back of a piano, formed with strong beams. The next stage is to build up the soundboard on to the back. If the frame to which the strings are attached were fitted flat to the wood, we should get a very deadened sound, so the soundboard is needed on which the frame can rest clear of the rest of the wood. Here the man is seen shaping and fitting the soundboard in readiness for the fixing of the iron frame and strings

PUTTING THE STRINGS IN THE PIANO



By this time an iron frame has been got ready. It is like an iron harp, and the strings, or wires, are joined on to it by metal pins, which can be twisted with a key. Iron is used because it cannot be pulled out of shape to let the piano get out of tune. Here the frame is being screwed down to the soundboard and the wires fitted to the metal pegs.



The first part of the tuning is done, and then the frame is set up on end—for this is an upright piano, not a flat "grand." The case is built round the works, and the piano begins to look like a real one. The workman's right hand is resting upon the woodwork which will carry the keyboard and the hammers which strike the notes.

THE HAMMERS THAT STRIKE THE NOTES

The most complicated part of the piano has now to be put in. This is called the action—the keys, the levers to which they are attached, and the little hammers that strike the wires and produce the notes. Levers and springs and hammers wonderfully made are set to work when we touch the keys of the piano.

The work is nearly finished. The frame has been put together, the case built up, the action made perfect. Now the expert tuner is testing every note and making each perfectly in tune. The metal pin is screwed to the right to tighten a wire whose note is too flat, or to the left to loosen a wire whose note is too sharp. Then the front is put in and the piano is ready to bring music into our homes.

Plain Answers to the Questions of the Children of the World

WHERE DOES AN APPLE COME FROM ?

We know that when we sow seeds properly they grow, and from a very small seed we may get a very big tree. It may be an apple tree, and it may produce hundreds of apples, year after year. Where do they all come from ?

Or, to take another instance, we plant one pound weight of tomato seed and get a hundred pounds weight of tomatoes. Where does all the difference come from ? It almost looks as if the hundred pounds of tomatoes were new weight in the world ; but the world gets scarcely any heavier, so that cannot be the truth. We are also quite certain that the stuff in the apples or the tomatoes is not made out of nothing, but comes from somewhere.

The apple, then, and the tomatoes have been made by the wonderful power of the living tree or plant out of the stuff which surrounds them. In the case of the tomatoes in the last question, we are quite sure that if we could have weighed the stuff taken as food by the first pound of tomatoes it would have weighed 99 pounds. The Earth as a whole is not any heavier ; merely, in the case of the tree, some of the things that make up the weight of the air, such as oxygen, and the carbon from the carbon dioxide on which the plant feeds, and some of the things which make up the weight of the ground, such as water and many salts, have been built into its body.

It is as if you had a house that could build itself, and make its own bricks into the bargain. And so it is in the case of the apples or the tomatoes—or you. Part of the Earth has been built into apples and tomatoes, and the builder in this case is the living plant. After a time—and this is true of every living creature—it dies, and the stuff which is taken from the Earth and the air for making its body is restored to them, and other living creatures use it in the same way ; and so there is a circle or cycle—the cycle of life—through which much of the stuff of the Earth and the air goes on passing from age to age.

It might be thought, then, that, as the air gives so much to the apple, the air would be lighter in summer, when the apple grows, than in winter, but we should not like to say that the air is lighter in summer than in winter on this account. In the first place, the weight of the air is so enormous that all the oxygen taken from it for the purposes of life would only be like a drop compared to the ocean ; and, in the second place, there are many other things happening which might work in the other direction.

For instance, under the influence of the Sun, many of the products of past life lying on the surface of the soil are broken up, and the oxygen they contain is given back to the air.

What is a Thunderbolt?

Long ago it was supposed that something, a " bolt," was actually thrown from the sky during a thunderstorm, and men thought God threw these thunderbolts to destroy those with whom He was angry. The Romans taught that the thunderbolt was the bolt of Jupiter, who was their chief god. But we know now that there is no such thing as a thunderbolt, and the damage it was supposed to do is really due to the violent passage of an electric current, lightning, from the air to the Earth, which damages anything it passes through.

What is Beauty?

We call anything beautiful which gives us pleasure, and that depends as much upon ourselves as upon what is outside us. Perhaps the majority of people find the sea, for instance, most beautiful when it is blue, and especially love the blue Mediterranean, where the skies are clear and intensely blue, and so the sea is blue, too. If someone has lived in Italy as a child, and has to live beside our grey sea when he is grown up, he will think that the grey sea is ugly, and that nothing can be so beautiful as the blue sea. But suppose a Scotsman who loves Scotland had to go and live in Italy. He might find the blue sea after a little while very uninteresting and with too much of a glare in it, and only when he went home and saw the grey sea again would he find the sea beautiful.

We are made in different ways, and grey may be just as beautiful as blue if you find the right persons to look at it, just as the cry of a baby may be found more sweet in someone's ears than the finest note of the finest singer that ever lived. Nothing is beautiful or ugly in itself, but " thinking makes it so."

What is Greenwich Time?

It is plain that as the Earth spins round, the Sun must appear to rise in the east sooner, the further east we are, and later, the further west we are. So the apparent time, judged by the Sun's rising and setting, is different in different places, according as they are east or west of each other; indeed, midday on one side of the earth is midnight on the other side. It is not a question of north or south, because the earth does not spin in the north-south line, but in the east-west line.

So it is necessary to have some agreed place from which to take our time, and the place on which many nations have agreed is Greenwich. They have their own time for their own purposes; but for general purposes, as, for instance, events occurring in the sky, they refer to Greenwich time—that is to say, the time reckoned by what the sun seems to do at Greenwich. The lines on maps up and down the earth's surface from north to south are called lines of longitude. They are narrower in the north and south than at the Equator, of course, and meet at the Poles—like the lines usually made by the knife when we cut a melon in the most usual way. Places on the same line of longitude as Greenwich have Greenwich time exactly, and no other place can have it.

Why Do We Swing our Arms When We Walk?

It is rather difficult to say exactly why we swing our arms when walking, but there is no doubt that it is much easier to walk in comfort if the arms are allowed to swing naturally than if they are held stiffly by the sides of the body. Probably, therefore, the swing of the arms assists us in unconsciously keeping accurate balance as we move along, first on one foot and then on the other. Perhaps, too, it may be partly a relic of the time when primitive animals used their arms as well as their legs in walking, as a chimpanzee will do.

In any case, the fact that it is so much more comfortable to walk swinging the arms seems to suggest that Nature may have intended the swinging to help us in accurate movement.

What Makes Us Hungry?

We have had many questions about animals which we have answered by saying that animals know things by *instinct*, and now we come to one or two questions about human beings which *we* know very much in the same way. No one needs to tell us when we are hungry. We know quite well without being told. It is one of the few instincts that human beings have. Even a baby knows when it is hungry.

It is a fortunate thing that the cells of which our bodies are made have this power of making their wants known to us. As soon as there is too little food in the body, it means that the blood has not enough nourishment in it. There is a sinking feeling in the pit of the stomach, and it is this feeling which we call hunger. This is one of the few things that a human being knows without having to learn it.

What is a Water-spout?

Just as the waves of the sea are due to movements of the air, so the very astonishing disturbance of the sea called a water-spout is also due to an unusual disturbance of the air. Sometimes parts of the air get started in a twisting motion, rushing through the air and at the same time turning round and round very quickly, somewhat as the earth rushes through space and turns round all the time.

When this happens the sea may be very violently disturbed ; and sometimes in the middle of this twisting portion of air there is very little air indeed—it is almost like a hollow twisting column of air. Then the water just beneath may be suddenly sucked up so as to fill the almost empty space inside this twisting column of air, and that makes a water-spout.

Where Does All The Dust Go To ?

Dust is made of very different things, and its fate varies accordingly. Some dust is mainly made of particles of carbon, and these are gradually washed into the soil by the rain. We do not know whether they are useful there. Some of them get into our lungs and stay there. Then much dust is made of organic matter—substances derived from living creatures, such as horses, for example.

These street deposits of animals are a very important part of town dust. They find their way into the sewers, and so to the seas ; or often to the soil, where, like all organic matter, they are extremely useful for the growth of vegetable life. This dust often gets into our eyes and throats, and probably helps to cause the colds that are so common in towns. Town dust will be really healthier when horses, dogs, and cats are kept under better control—if, indeed, they are allowed in towns at all. Also, a considerable part of the organic matter in dust is consumed and oxidised by the oxygen of the air, partly under the influence of the sun, and partly by the action of microbes.

How Does Rubber Rub Out Ink?

When indiarubber rubs out ink or pencil, or pumice-stone rubs out ink-stains on our skin, what happens is really the same in every case. It is the rubbing, or the friction, that actually rubs away the outer layers of the paper or the skin, and so removes anything that they may contain. Soft indiarubber rubs away only the surface-layer of paper, but that is enough for pencil-marks, which only deposit a thin layer of carbon on the surface of the paper. A harder rubber—or a knife-edge, which acts in exactly the same way—will rub off a thicker layer of paper, and so will remove ink-marks, which penetrate much more deeply into paper, being made by a liquid. Pumice-stone is hardest of all, and when we rub our fingers with it, it removes ink-stains, which are deeply absorbed by our outer skin, as indiarubber could never do.

Why Does Mother Put a Marble in the Kettle?

The water we boil in a kettle is never pure water, but contains many things. It contains salts, which are apt to be deposited in the kettle as the water boils away. It also contains acids, which are able to act on the iron of the kettle, and turn it into salts of iron, which also fall to the bottom ; besides this, they are actually made by the water from the inside of the bottom of the kettle. We suppose, then, that people have noticed that if they put a marble in the kettle, it collects these salts and prevents these things from settling inside it, and keeps the inside of it smooth.

Why Do We Lose the Sense of Smell When We Have a Cold?

The sense of smell depends upon scented things coming in the air to the lining of our noses, especially certain parts of the lining of the nose. When we have a cold, this lining, or mucous membrane, of the nose gets swollen, and produces a much greater amount of mucus than usual, as we all can tell by the number of handkerchiefs we have to use in a day.

The chief reason why we cannot smell so well when we have a cold is probably that this mucus, constantly pouring out of the lining of the nose and running over it, prevents the scent of things getting to the sensitive part of the nose, and washes away any solid scented particles that there may be in the air. Also, it may very likely be that the poisons produced by the microbes that cause a cold, poison the living cells of the mucous membrane, and also poison the tiny ends of the nerves of smell that run to it, so that even if scented things do reach the sensitive part of the mucous membrane, they cannot be felt.

This applies alike to scents coming in from outside and also to the scents of food, which pass up at the back of the roof of the mouth into the nose, and which, when we have not a cold, help to give our food half its flavour.

How Do Fish Live in a Frozen Pond?

Ordinary ice, we know, is lighter than water, and therefore it floats. So what we call a frozen pond is a pond of which the surface is frozen. Skaters are perfectly aware of this. They want to know how thick the ice is, for they know that there is liquid water underneath it. So when we speak about fish living in a frozen pond, we mean fish living in liquid water that has a layer of frozen water above it.

The really serious part of this for the fish is not, as we might think, the coldness of the water they are in, but the question how that water is to be supplied with enough air for the fish to live by. When a pond is not frozen, oxygen from the air above it is passing into the surface of the water as fast as it is being used up by the fish and other living creatures in the water.

When a pond is frozen, this process is very nearly stopped. There may be gaps in the ice here and there—air-holes, such as air-breathing creatures will make in the frozen North—but perhaps there may be none of these. A little oxygen may get through at the edge of the ice, but the best hope for the fish is that there is a supply of new water coming into the pond below the ice from somewhere else, and bringing enough oxygen dissolved in it to keep the fish alive. If the supply of oxygen is kept up in none of these ways, then, when there is no more of it left, the fish will surely die, as must every living creature that is prevented from breathing, whether it be man, mammal, bird, reptile, fish, or moss.

What is an Escalator?

An escalator is a flight of stairs, always moving, so that it carries us to the top while we stand still. Our great-great-grandfathers would have thought such a thing a miracle, but the escalator—which simply means moving staircase—is becoming quite common today. It originated in America, but there are many now at the underground railway stations in London.

The escalator developed from the endless band used for conveying goods in factories, and many years ago such a band, placed at an incline, used to carry visitors from the lower parade at Southend to the top of the cliff. It was an early form of escalator without steps.

The escalator differs from the moving inclined plane in having stairs which travel up or down, the steps being horizontal all the time. Passengers going up can increase their rate of progress by walking up the stairs while they are moving, thus adding their own motion to that of the escalator.

When the steps reach the top they form a horizontal plane and carry the passenger to the stationary landing, where he is left while the steps travel on and, turning round a roller, go upside down underneath the staircase to the bottom again.

The average escalator travels about forty feet a minute, which is not too fast to allow passengers to step on or off with perfect ease and safety. An endless handrail of leather on each side moves with the stairs and enables inexperienced people to steady themselves. The great advantage of the escalator over the lift is that it is always moving and can be used at any time by any number of passengers.

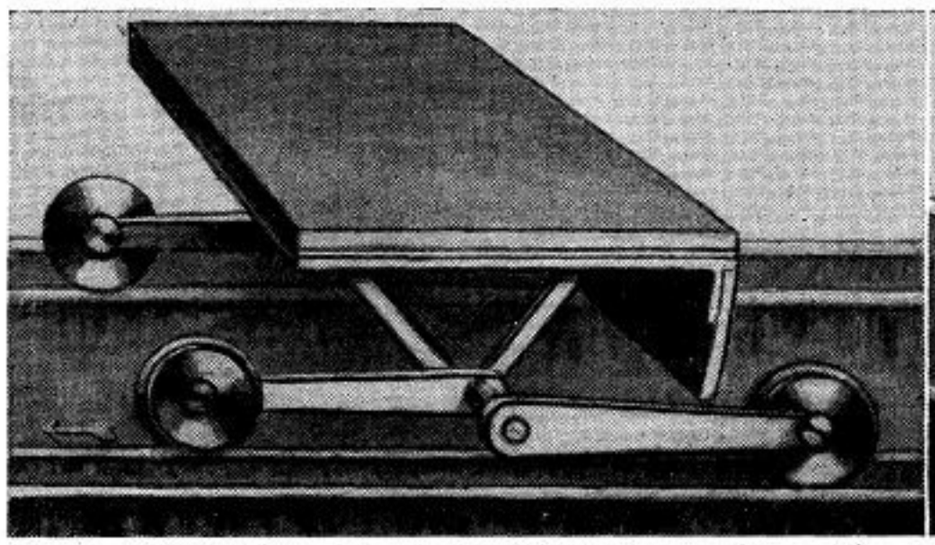
Why is a Needle no Heavier when Magnetised?

This question puzzles us because we have not clearly distinguished in our own minds what weight really means and what it does not mean.

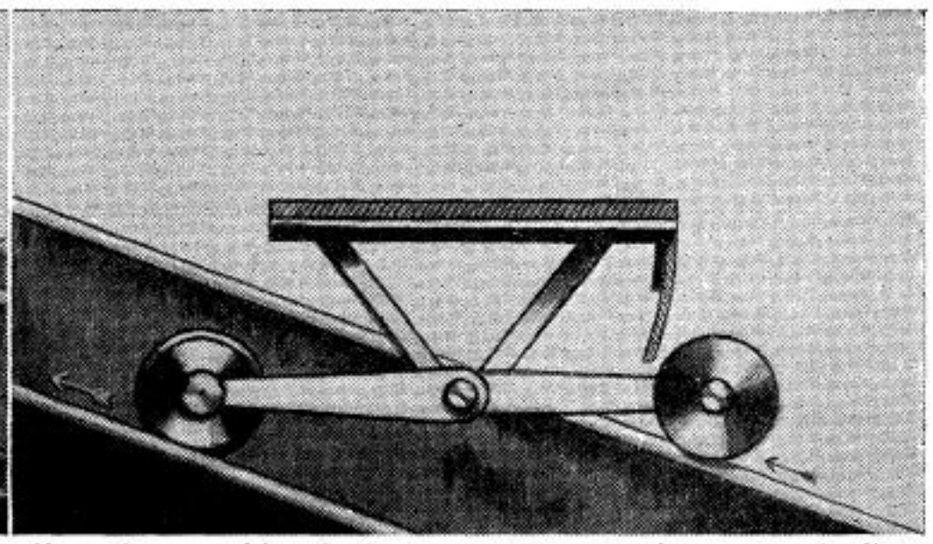
All weight is a direct consequence of gravitation, and of nothing else. Were there no gravitation, there would be no such thing as weight. The power of gravitation entirely depends upon the amount of stuff that is concerned, or the mass of matter that is acted upon. In other words, the weight of a thing depends entirely upon its mass—the amount of matter in it. Everything goes to prove that nothing affects gravitation except this question of the amount of matter present.

If we take a needle and heat it or cool it, magnetise it or unmagnetise it, or do anything else to it, so long as we do not take away any of the matter from it or add any new matter to it, its weight remains the same. When we magnetise it, we endow it with a new power which is very strong and wonderful, and which, for instance, can be brought to bear in such a way that it will overpower the force of gravitation, and will thus enable the needle to lift ten times its own weight. But the weight of the needle itself absolutely depends upon its mass, and upon nothing else. Our bodies weigh just the same whether we hold a weight in our hands or not; the amount of stuff in our bodies is the same in either case. Of course, our bodies and the weight together weigh more than our bodies would alone, but that is a different thing.

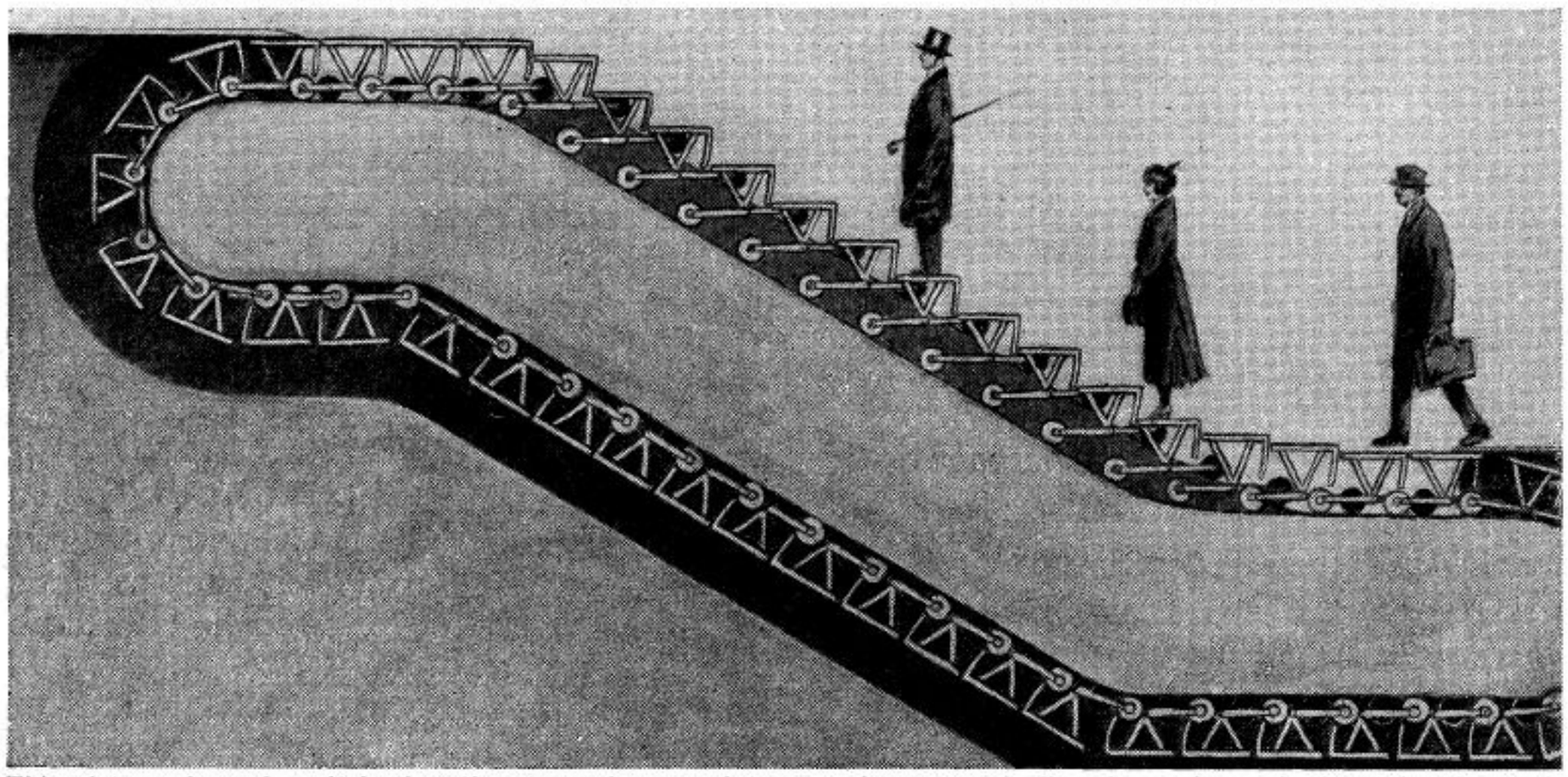
HOW THE MOVING STAIRCASE WORKS



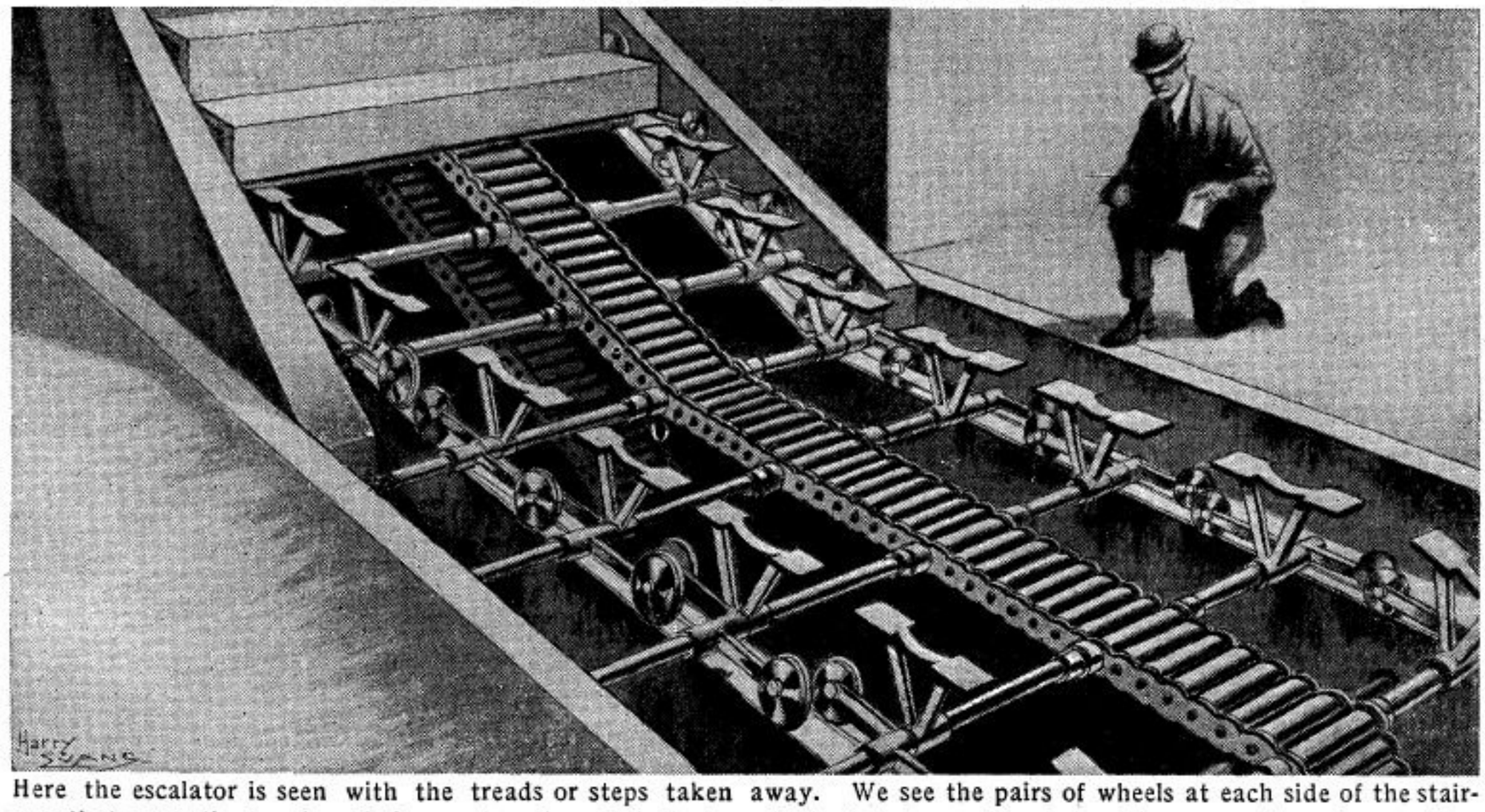
The moving staircase, or escalator, is made up of a number of separate steps, each consisting of a tread to stand on and a riser or perpendicular piece below the tread. This picture shows one of the steps in its horizontal position before it begins to move up an incline.



Here is one side of the same step moving up an incline. We must imagine a similar pair of wheels at the other side of the step. Two wheels, one on each side, follow a lower track and two an upper track, and the next picture shows the reason for this arrangement.



This picture shows how it is that the steps of an escalator, moving up an incline, keep always horizontal. The whole staircase is kept moving by means of an endless chain, shown in the next picture. When the steps reach the top they are carried over a big wheel, or roller, and return upside down to the bottom.



Here the escalator is seen with the treads or steps taken away. We see the pairs of wheels at each side of the staircase that carry the tread, and the great endless chain in the middle that keeps the whole staircase moving. An escalator like that at some of the tube stations in London can carry up from the platform 11,000 passengers an hour.

Why are there More Stars Some Nights than Others?

There are not more stars some nights than others, but we see more. What really happens is that the state of the atmosphere differs very much at different times, quite apart from the presence of actual clouds. Even when there are no clouds anywhere, and all over the sky the brighter stars can be seen, the state of the air may be such—whether owing to the presence of a lot of dust high up in it, or to other causes—that the less bright stars cannot be seen. The temperature and the pressure of the air have their own effects in this respect. Much of the recent advance in astronomy has been due to the fact that great new observatories, containing the finest telescopes in the world, have been specially built on the tops of mountains, or, at any rate, as high up as possible in parts of the world specially chosen for the clearness of the air; and the higher the telescope, of course, the less the amount of clear air that the light from the stars has to pass through before it reaches the eye of the astronomer or the lens of the camera.

What is Papyrus?

The papyrus is a kind of sedge from eight to ten feet high, found chiefly in Africa. It has been almost as important for the growth of man's mind as wheat for the growth of his body. From its pith was made the first paper, and for hundreds of years papyrus paper was the chief medium for the record of the thoughts of men. The paper was made of strips of the pith cemented together into sheets, which could be rolled up into scrolls, but later the sheets were bound into pages in book form. Some of the sheets were seven feet long. In Egypt many valuable and interesting scrolls have been found, including previously unknown fragments of Euripides, and a famous but lost work of Aristotle on the constitution of Athens.

Do Things Weigh Heavier or Lighter when Hot or Cold?

This question about gravitation is really extremely interesting, because it so happens that this is one of the very questions on which a great many remarkable experiments have quite lately been made.

There is no doubt about the answer to it, but we must understand what that answer really is. It is that the power of gravitation is not in the slightest degree affected by temperature; in other words, one and the same thing—if nothing is taken from it or added to it—weighs just the same, however much it is heated, or however much it is cooled.

But we must not be confused. When a thing is heated it swells, as a rule, and as there is no more of it there, but it is occupying more space, it is made lighter *in proportion to the space it occupies.* Thus hot water will float on the top of cold water; hot air will rise in cold air, and so on. This, however, is not a question of absolute weight, but of the relation between that weight, *which is not changed,* and the volume of the thing.

Does a Light-Wave go through Glass?

Light is *not* a wave of air, but a wave in the ether, which is everywhere—in the air and in the glass, too. When the light passes through glass, it is a wave in ether all the time, though during part of its journey the kind of matter called air is there, and in another part glass.

This is not to say that matter has no effect on these ether-waves, for we know that it has. All we can say is that some kinds of matter offer no great obstacle to their passage, as, for instance, glass; while other kinds of matter, such as wood or stone, interfere very much with their passage. Sound *is* a wave of air, and where sound passes through glass, the air-wave on the outside throws the glass into a wave of the same kind, and the wave in the glass starts a new wave in the air on the other side, and so the sound goes on.

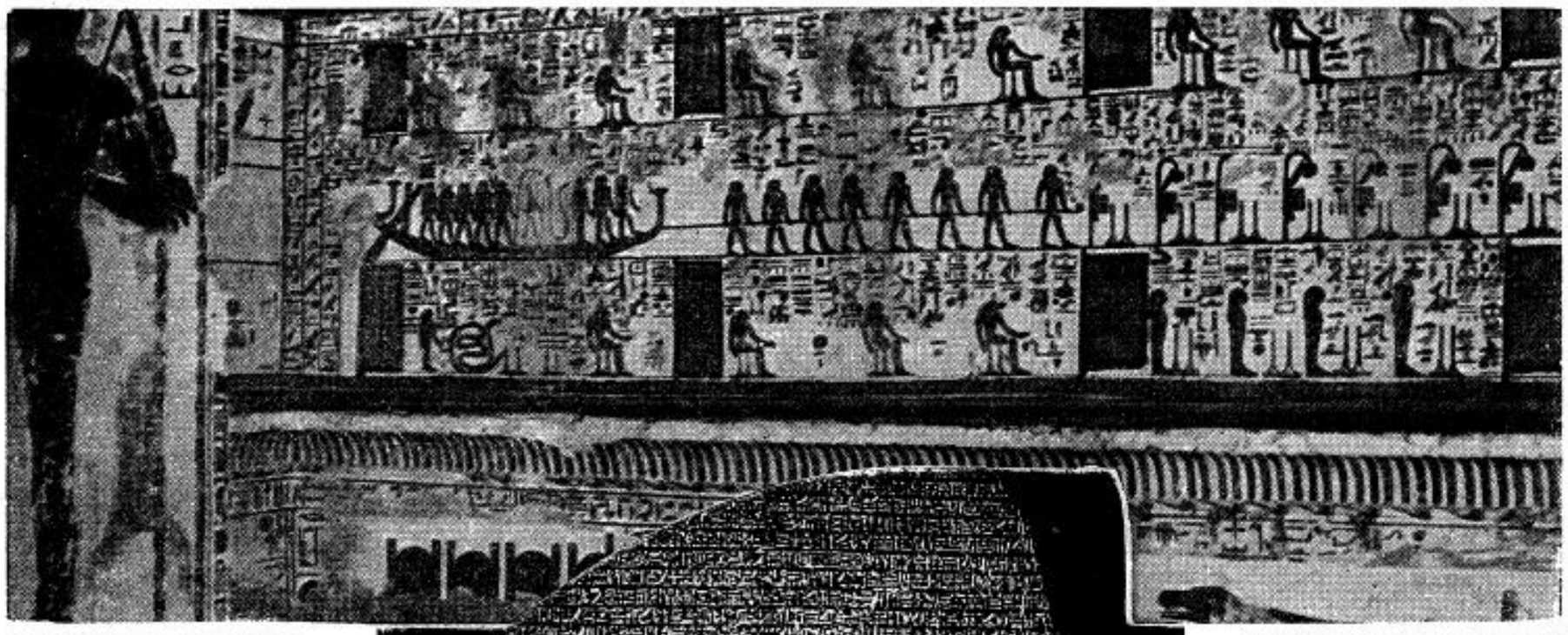
How Can We Tell How Many Days There are in Another World's Year?

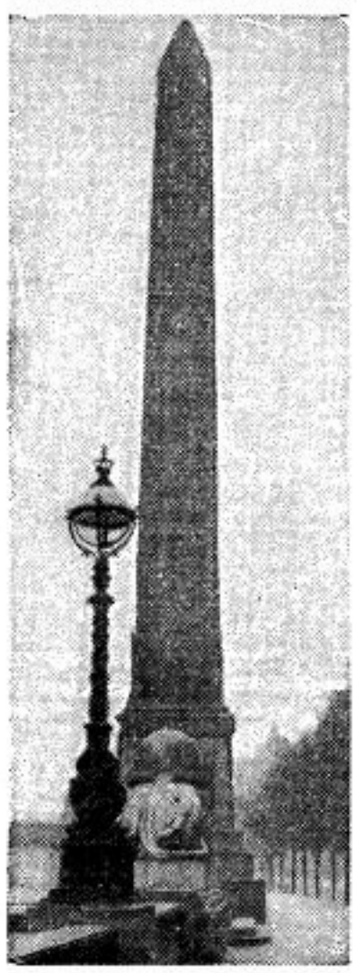
If we know how long a planet takes to go once round the Sun, we know the length of its year. Then, if we can watch the planet, and see how long it takes to spin round once on itself, we know the length of its day. Divide the length of the year by the length of the day, and we have the number of days in the year. But though that is quite easy in some cases, in others it is impossible, and so we cannot yet tell the number of days in a year of any planet.

The trouble is that, though we know how long the planet takes to go round the Sun, in some cases—as in the case of Neptune—the planet is so far away that we cannot make out any of the features of its face, and therefore cannot tell at what rate it spins, or even that it spins at all, and we do not know the length of its day, though we do know the length of its year.

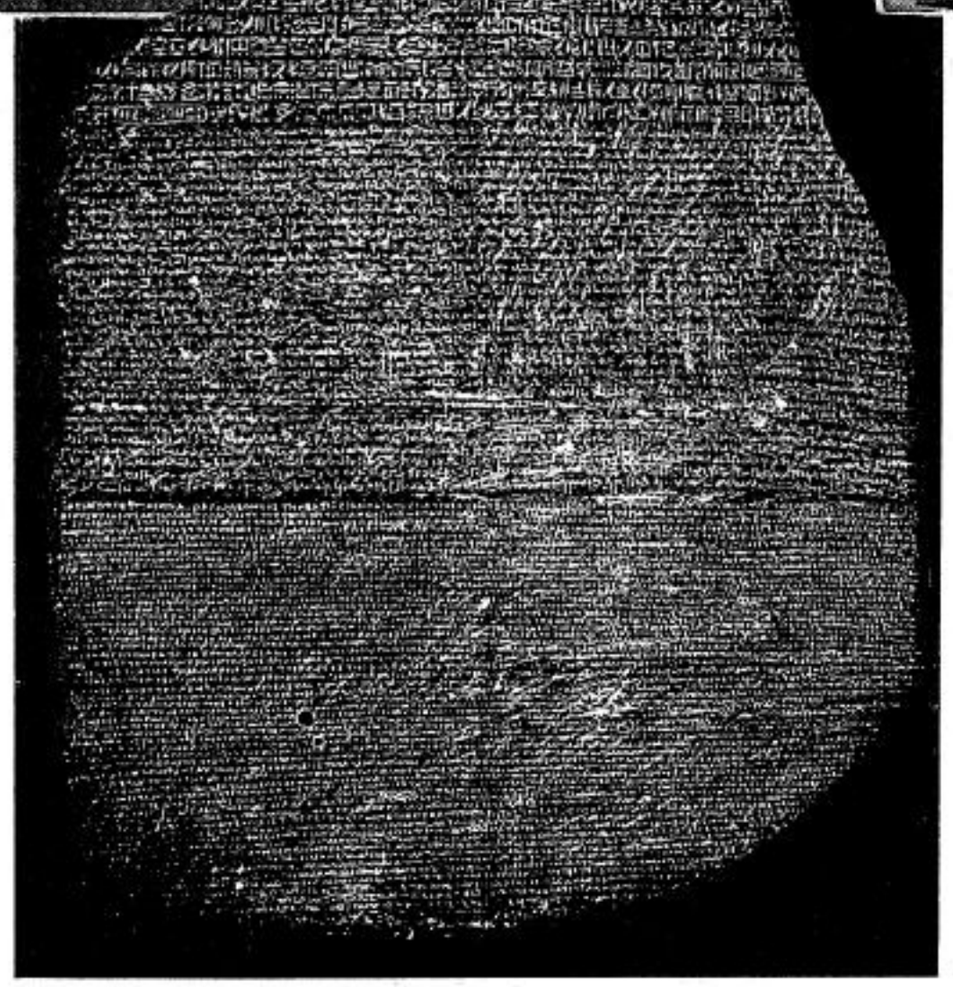
HOW MEN WROTE IN THE DAYS BEFORE PAPER

The Egyptians painted the walls of their temples and tombs with strange letters and pictures which tell the history of Egypt. This is from the wall of a tomb where the paint is still fresh, though it is thousands of years old.





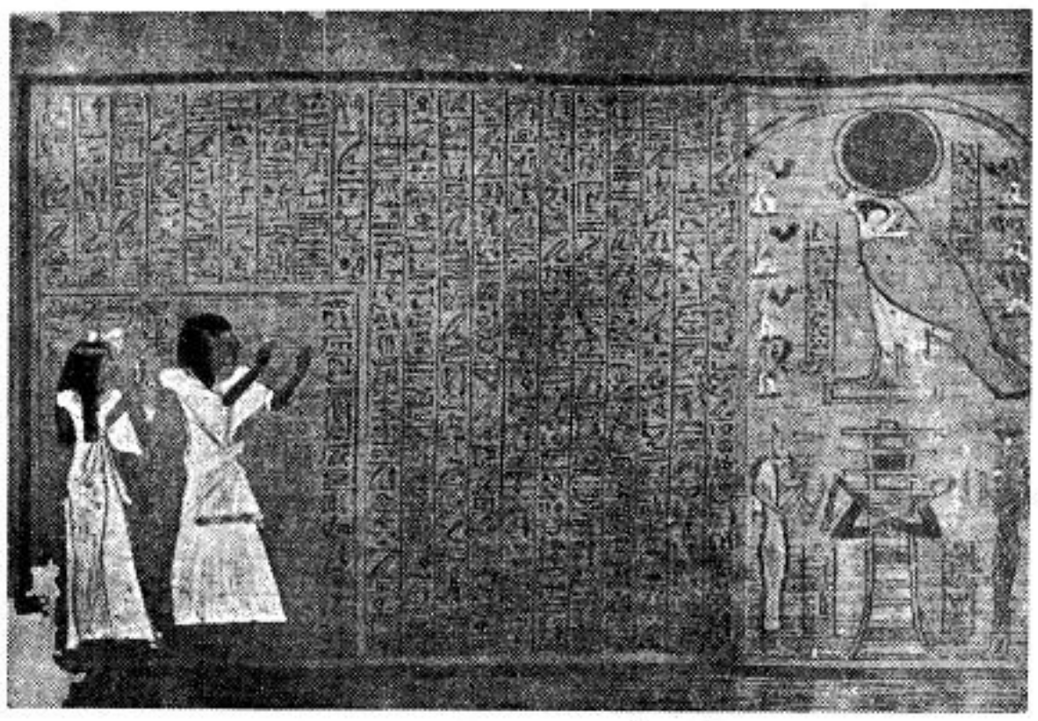
Cleopatra's Needle, once in Egypt, and now standing by the Thames in London, shows the strange writing on the Egyptian monuments.



The Rosetta Stone, which taught us to read the strange writing the Egyptians left behind. It said the same thing in three kinds of writing, and one kind was the Egyptian. Men knew one of the other kinds of writing, so that they were able to find out what the Egyptian writing meant.

There was no paper in old Egypt, and the people wrote on bricks and on the dried pith of the papyrus plant, here shown growing.

An early way of writing was to mark soft clay and bake it into a brick like this.



This is a piece of papyrus, showing how the Egyptians used it to write upon. Nearly all these things are in the British Museum.

Why Does Steam put a Light Out?

Of course, it depends upon the kind of light whether steam will or will not put it out, but it is certainly true that a fire or a lighted gas-jet or a lamp may be put out by steam.

For this there are at least two reasons. We use the word steam rather loosely, often meaning by it liquid water in the air—the steam that we can see. But sometimes we mean by it water-vapour. Wherever there is steam, there is water-vapour—that is to say, water in the air in the form of an invisible gas. Now, this water is already burnt ; it can neither be burnt any more, nor can it sustain the burning of anything else.

In so far as the thing which produces the light is supplied with water-vapour in the air instead of oxygen, it is starved and must go out. But the presence of steam means also the presence of liquid water, and liquid water puts a light out because it so quickly swallows up into itself the heat which is near it, and makes the burning thing so cold that it cannot burn. Every man who smokes a pipe knows the great difference there is between smoking moist tobacco and dry tobacco.

What is Smoke Made of?

Smoke is the result of imperfect burning. Most of the things from which we get so much smoke—like coal—if they were properly burnt, would form nothing but gases, which we could not see, and which would very soon fly away and do no harm to anybody. But in order to burn coal properly some trouble and care are required. When we burn coal in an ordinary fire, we do not supply enough air to it. We put the fresh coal on at the top instead of at the bottom, as we should, and so we only partly burn the coal, and small specks of it, unburnt, are carried up in the draught, and make smoke. The chief stuff in smoke is simply coal in specks of various sizes. But the trouble is that a great deal of oily stuff comes out of the coal, and covers the specks of it in smoke, so that these stick to things. We all do wrong in this respect in our fires at home, and the time will come when we shall make our fireplaces differently, so that we can burn our coal in a better way.

At present the smoke makes black fogs in many cities, and cuts off a great quantity of the daylight by which we live, besides making everything dirty, destroying plants and trees, and filling our lungs with dirt which we never get rid of. There are few things about which we are more careless than smoke, and if we had sense enough we should stop making it, even if it were only for the reason that all the stuff in smoke might be burnt, and that in making smoke we waste a great deal of fuel.

What Makes Water Gurgle When it Comes out of a Bottle?

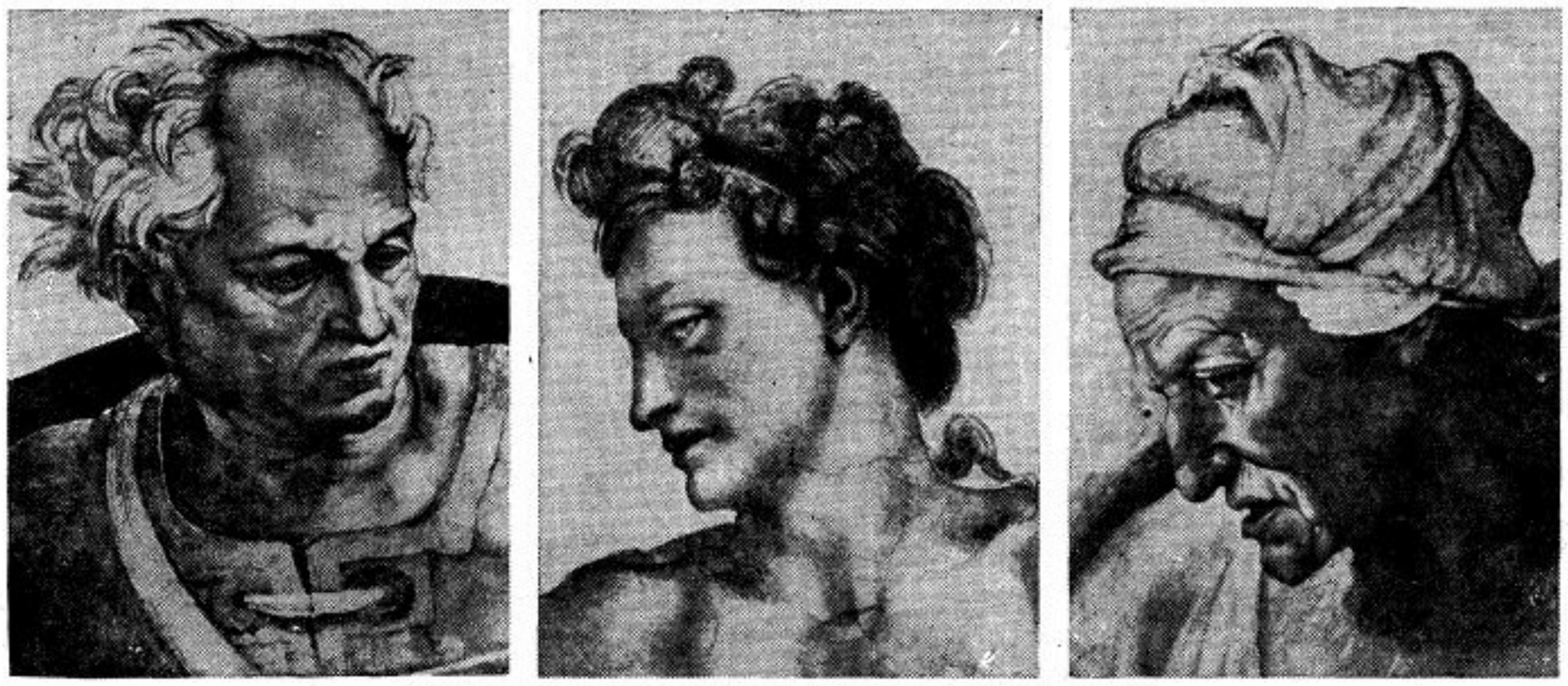
We know that the air has pressure, and so, if there is an empty space anywhere, the air will press into it. Now, when we pour water out of a bottle which is full, there must be an empty space left behind in the bottle when the liquid comes out, and from moment to moment, as that empty space tends to be formed in the bottle, the air outside is bound to rush in to take its place. If the bottle has a wide mouth, like a tumbler, then, as we pour the liquid out, air can flow in evenly, and there is no gurgling.

But if we take a full ginger-beer bottle, and hold it upside down, then there is a series of fights going on between the liquid which is trying to get out under the pull of gravitation and the air which is trying to push its way past the liquid to fill up the space in the bottle. Sometimes the air pushes back the ginger-beer, and sometimes the ginger-beer pushes back the air. This means that the air is thrown into little disturbances, which we hear as gurgles. We say that water gurgles, but really it is the air that is disturbed by this contest between it and the water, and we call these disturbances "gurgles."

Why Does a Glow-worm Glow?

A glow-worm is not a worm at all, but is really a kind of beetle seen during the summer months up to the end of August, on warm banks and hedgerows and in woods and pastures. As soon as the evening's dusk begins, this beautiful insect begins to show a most exquisite yellowish-green light, caused by what are called luminous organs placed over the tail end.

The object of this light is not actually certain, but most of the wise men who study living creatures suppose that the female shows the light for the purpose of attracting males, which do not shine in this way. Whether this is the real reason or not we cannot be quite sure, but the glow-worm is only one of many animals which show light by means of what is called phosphorescence.



Three heads in the Sistine Chapel by Michael Angelo

LEONARDO AND MICHAEL ANGELO

HERE and there, in the progress of the world, Time and Fate turn author and tell a story, and the older the world grows the more fantastic the tale seems. Such a story comes in the growth of Southern Europe from the twelfth to the fifteenth centuries.

At the beginning of this period people were profoundly ignorant of the universe. Their only mathematics were simple addition, subtraction, and multiplication. Their idea of astronomy was a kind of chart of the heavens from which it was possible to understand certain simple phenomena, such as the habits of the Moon that controlled the Church festival of Eastertide. Greek and Roman culture, we must remember, had been stamped out of Italy by the repeated inroads of barbaric tribes from Central Europe, and now made its home in Byzantium.

Over the benighted continent a light of knowledge presently spread, directed from Spain, where the Moors were living as conquerors. Spain, in the twelfth century, was hundreds of years ahead of the rest of Europe ; she had universities, astronomical observatories, and science laboratories, all the results of the Moorish occupation. The culture of the gifted Mohammedan peoples spread among the Christianised countries of Europe and aroused an intense curiosity.

It is difficult for us to realise how magical and wonderful was this awakening of an intellectually slothful continent. Men were like children at school, learning for the first time the secrets of the world ; hunger for knowledge sent them, often barefoot, with the student's wallet, begging their way from one university to another. To be a scholar in those days was to be a member of a secret brotherhood, and to hold a sure claim on people's sympathy.

The same kind of curiosity was presently, in the fifteenth century, to lead to the discovery of the New World and all the romantic and perilous voyages of our own Elizabethan seamen.

In the meantime a dormant sense of beauty had stirred, as we have seen, in the countries where the Gothic spirit was felt, and first the Sienese, then the Florentines, Umbrians, and Venetians were working and experimenting, generation by generation, toward a full realisation of what great art meant.

In the fifteenth century came another element into art. Sultan Mohammed II conquered Byzantium, and the Greeks, flying westward, took refuge in Italy,

bringing with them their rich sense of beauty, their immortal traditions.

It seems strange that in Italy, at one time the stronghold of Greek and Roman culture, pagan beauty should ever have slumbered, and that the active presence of the Greeks should be necessary to remind the country of their old dominion ; but that is one of the queer chapters in this medieval and awakened Italy.

The Christians of the early centuries were surrounded by the buildings and the arts of Rome and Greece, and seemed simply to be unaware of their merit. They pillaged the pagan halls for the pillars and capitals of their churches, taking from them all the marble they could ; and this extraordinary indifference to the claims of the past persisted a thousand years, until the Greeks themselves, coming back, reminded them. Then the Italians looked about and tried to rescue from further destruction any monuments that remained, and they began to turn back to the ancients for study.

AN INTELLECTUAL AND ARTISTIC GENIUS TRIES TO FLY

Thus we see three marvellous forces at work to produce the paintings and sculpture of the fifteenth and sixteenth centuries in Italy—first the early renaissance in Tuscany, due to the Gothic spirit ; then the growth of learning which infected artists and made them restless, unsatisfied with their own achievement ; then again the inroad of Greek culture from the East.

All these forces centre in one Florentine painter, Leonardo da Vinci, who lived from 1452 to 1519. He was an intellectual as well as an artistic genius, a man of most brilliant gifts, any one of which would have set him apart and set him on a peak among his fellows. He, in his own person, should absolve artists for ever from the slur cast on them by men more practical and less imaginative.

There was scarcely a by-road, certainly there was not a highway of learning, that he did not explore. He foresaw several of the inventions which hundreds of years later were to revolutionise social life. He was philosopher, architect, engineer, physicist, chemist, geologist ; he discovered the use of steam power and experimented in hydraulics. At one time he was military engineer to Caesar Borgia ; when he was over sixty, a guest in the Vatican, he neglected painting pictures for the Pope in order to try once more to work out his idea of a machine that would fly in the air.

It would seem that to this man fortune had already come with both hands full ; as if that were not enough, another gift was tossed to him—genius in art.

Unlike many painters and poets, there was no need for Leonardo to wait till he was dead to be called great ; he was truly the living master, in himself his greatest picture—one of the most fascinating and compelling forces in a century already coloured with genius and gold-dusted with heavenly ideals.

LEONARDO'S FAMOUS PICTURE OF THE LAST SUPPER

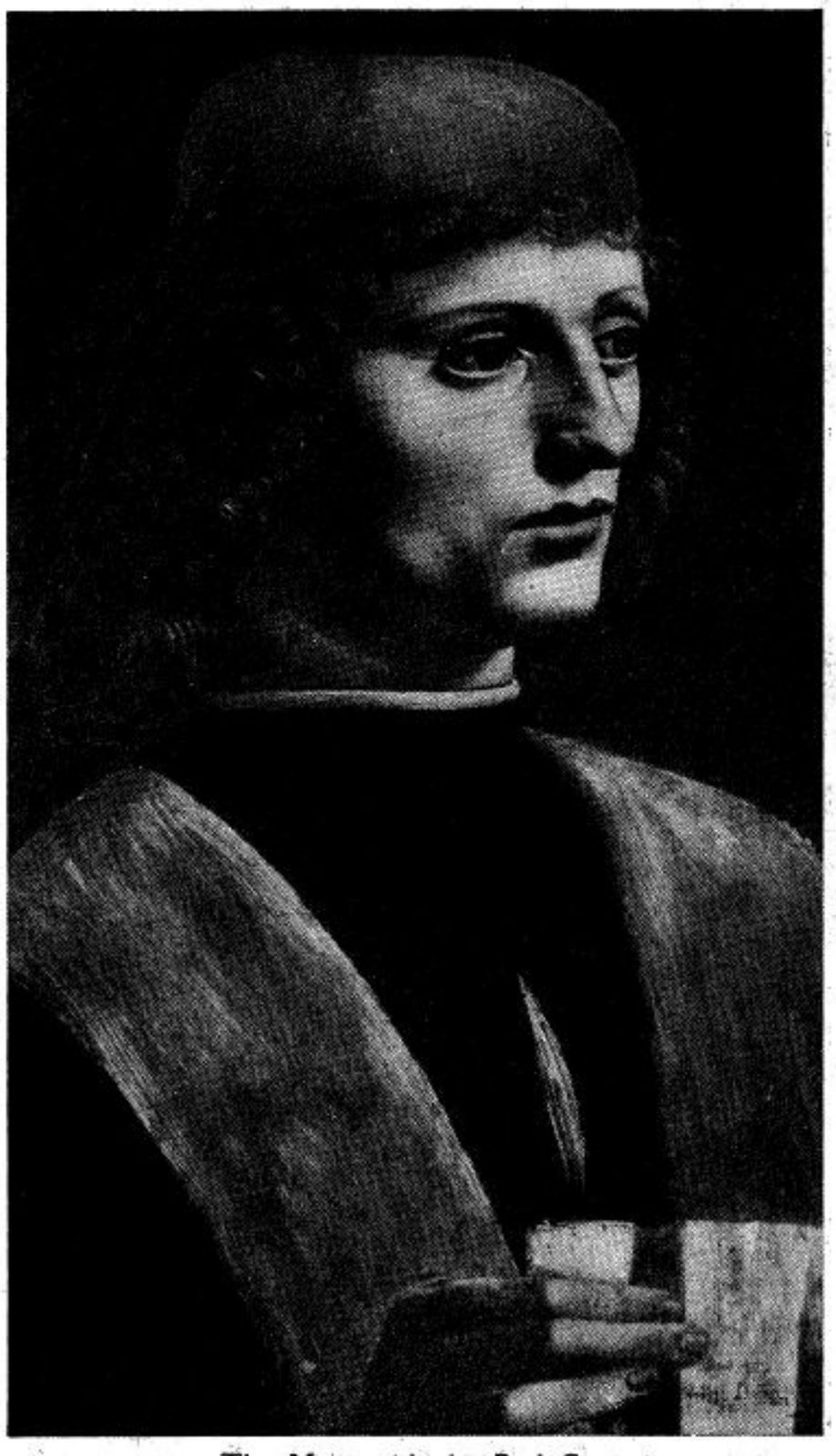
Very little of Leonardo's art is left to us, and this is partly because of the accident of circumstance, partly the painter's own wilfulness—in one immortal instance—in working in a wrong medium, and partly his profound self distrust. His searchlight of criticism turned pitilessly on his own work, delaying its execution. There are four great paintings of his left to us, and one of these is but a ghost, a wreck of its own magnificence. It is the first of the two pictures which leap to the eye when the name of Leonardo da Vinci is mentioned—The Last Supper.

Many people, thinking of the story of the Last Supper as told in the Bible, think of Leonardo's picture of it—of that long table where Christ and the twelve disciples were seated, of the separate horror, fear, and curiosity chasing themselves across the faces of the apostles as the Master said : " One of you shall betray me " ; and one after another they asked, " Lord, is it I ? " The expression in this picture of those human feelings, and of Christ's own superb and sorrowful indifference, is sheer genius.

THE PITIFUL DESTRUCTION OF A NOBLE MONUMENT

The Last Supper was painted in a method that peculiarly reveals the workings of the artist's wayward spirit. It was done for the Dominican Friars of St. Maria delle Grazie, at the command of Lodovico Sforza, the Duke of Milan, Leonardo's patron. The artist was engaged by this nobleman, at a handsome salary, to execute various works of art, the chief being an equestrian bronze statue of the duke's father.

PICTURES BY LEONARDO AND HIS PUPIL

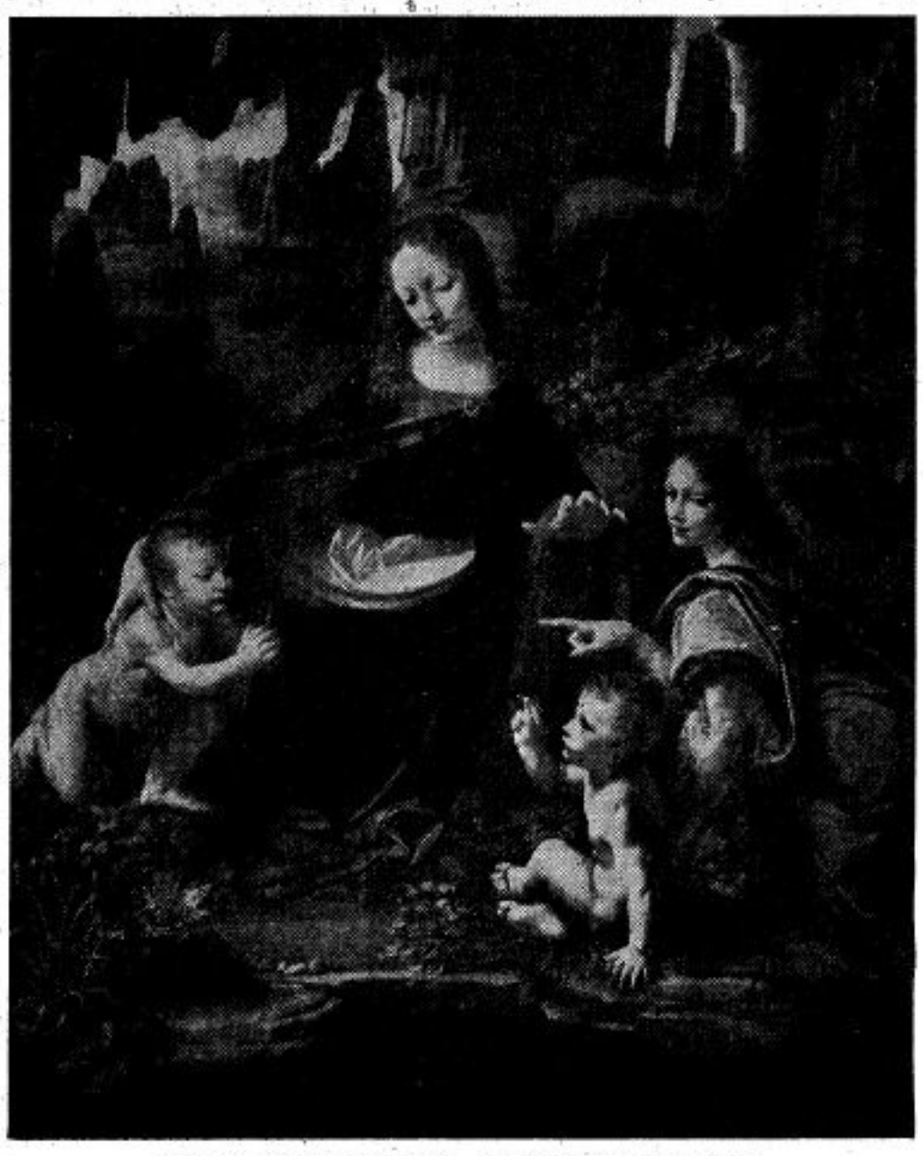


The Man with the Red Cap

Beatrice d'Este or Bianca Sforza

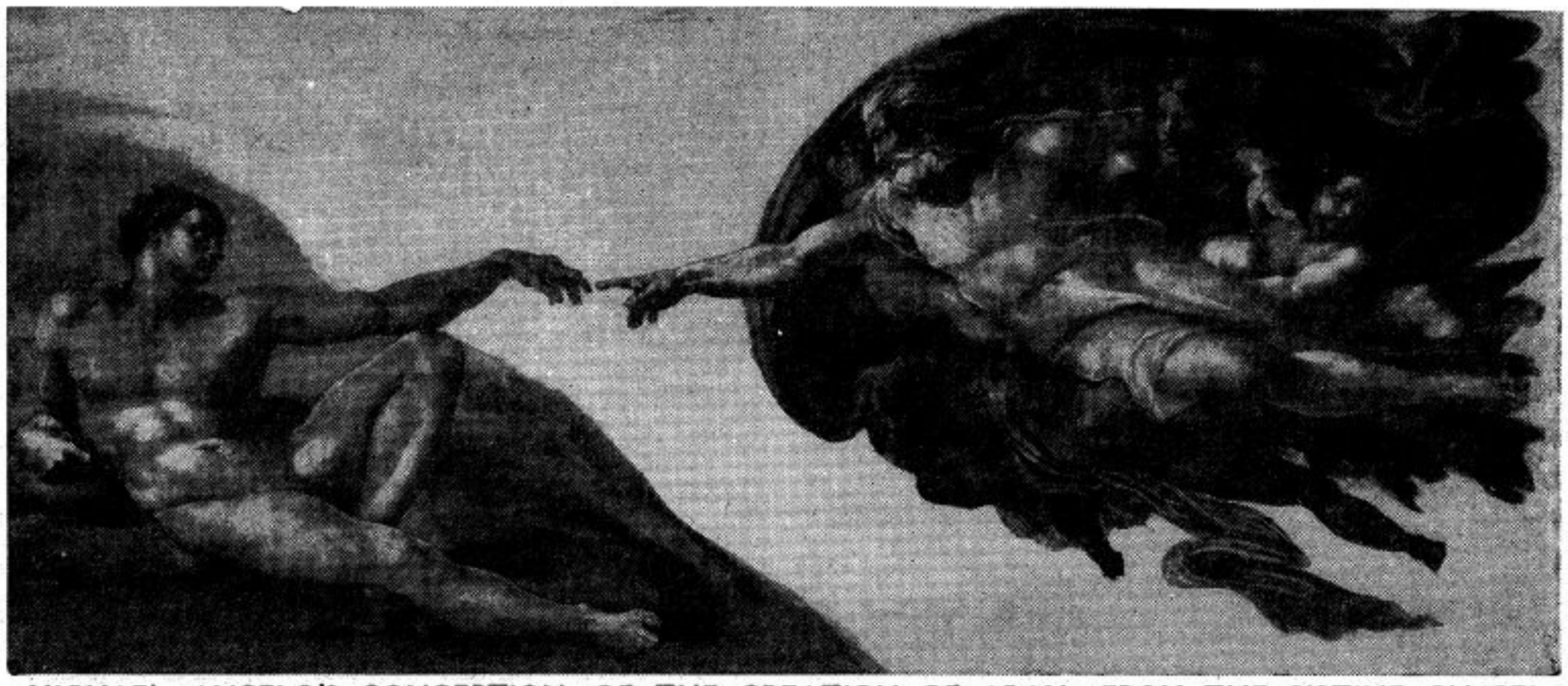
PORTRAITS ONCE ATTRIBUTED TO LEONARDO BUT PROBABLY BY AMBROGIO DE PREDIS, HIS PUPIL

MARY, SAINT ANNE, AND THE INFANT JESUS
BY LEONARDO

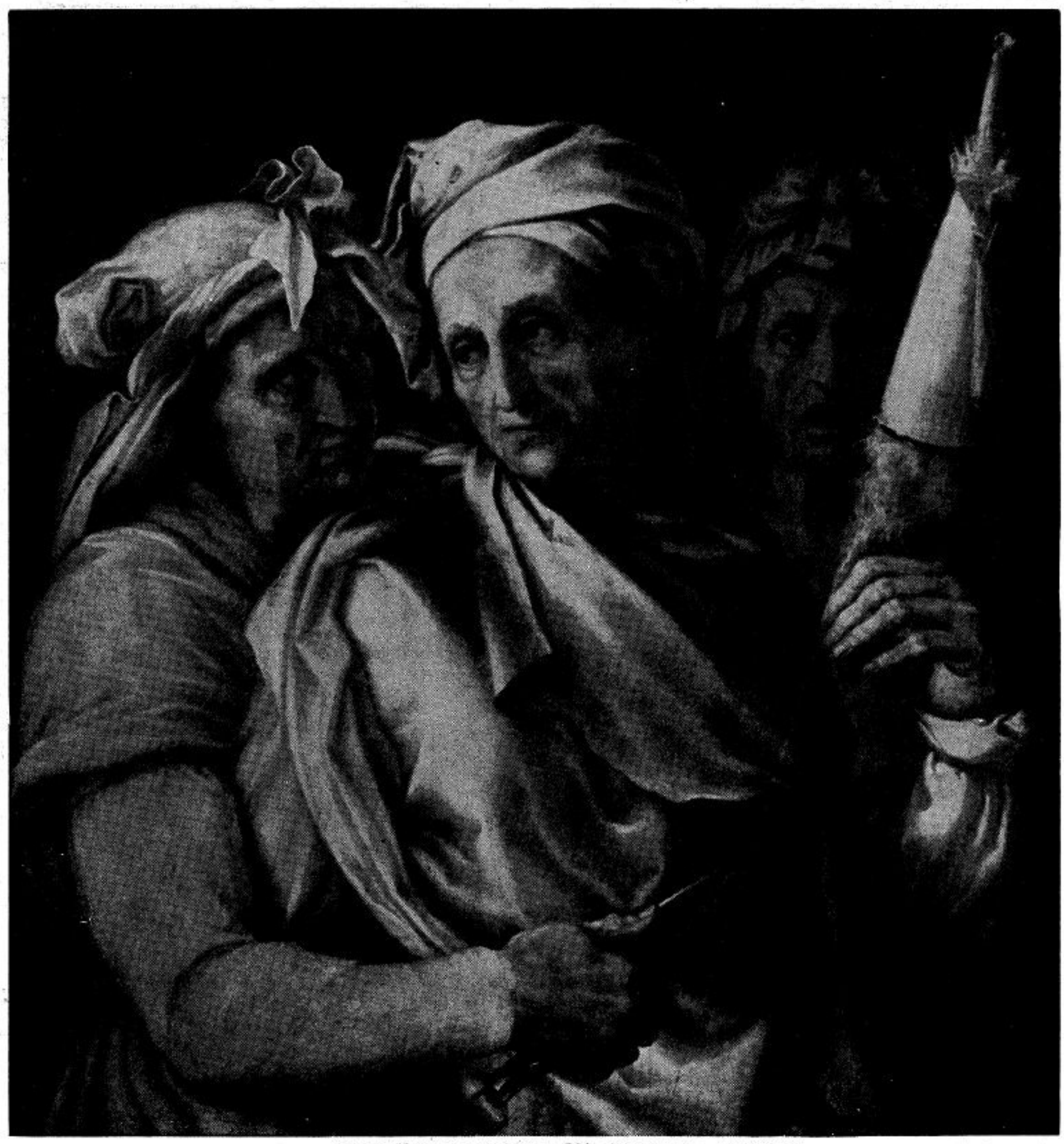


THE MADONNA OF THE ROCKS
BY LEONARDO

PICTURES BY THE WORLD'S GREATEST ARTIST

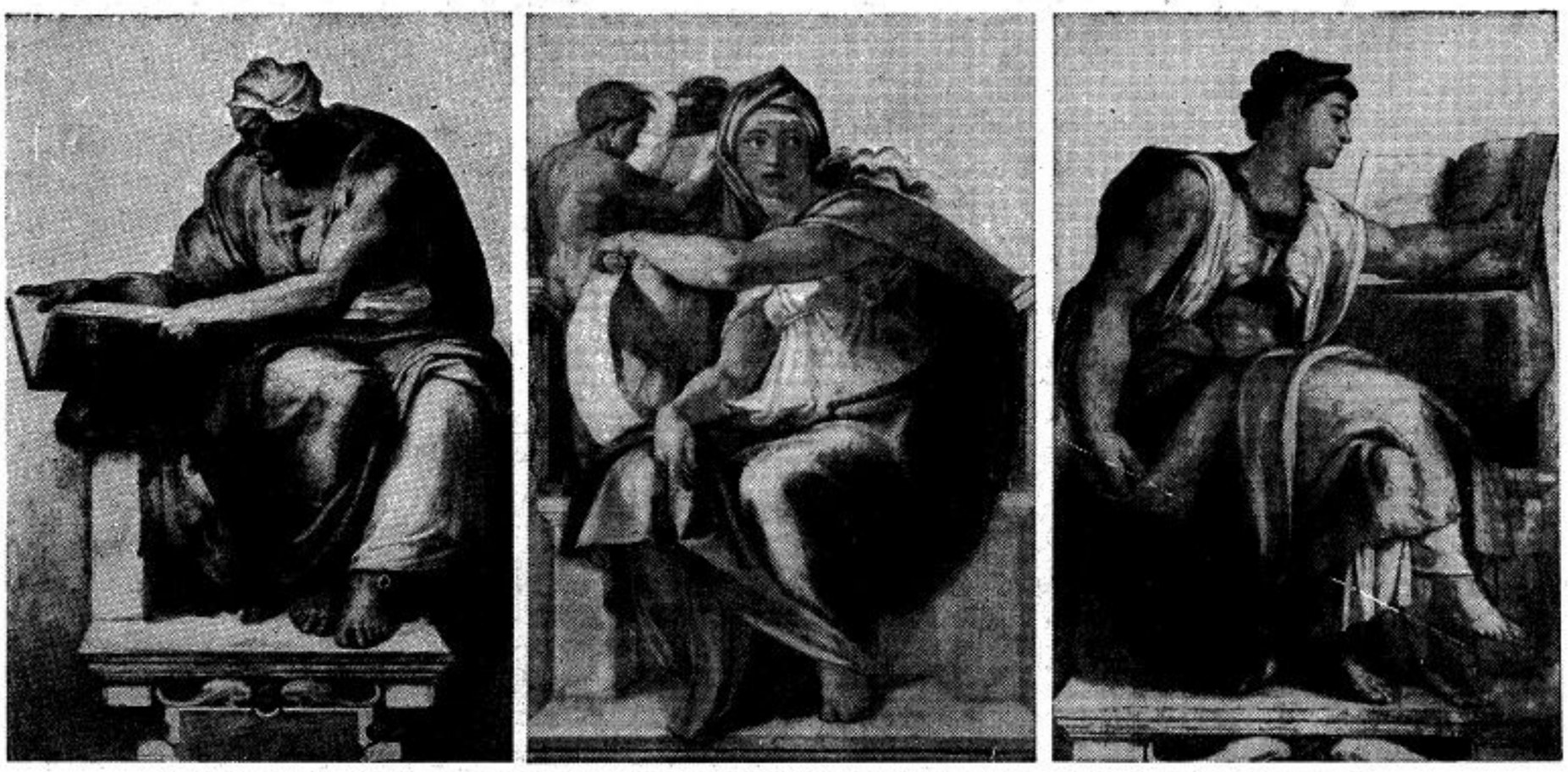


MICHAEL ANGELO'S CONCEPTION OF THE CREATION OF ADAM—FROM THE SISTINE CHAPEL



THE THREE FATES—BY MICHAEL ANGELO

MICHAEL ANGELO'S HOLY FAMILY



THREE OF THE NOBLE FIGURES ON THE CEILING OF THE SISTINE CHAPEL

THE HOLY FAMILY, BY MICHAEL ANGELO

Upon this work Leonardo spent the best of sixteen years, tortured by his inability to work out his own superb ideal, again and again making a new sketch and beginning the figures afresh. At the end of the sixteen years the model was ready to be cast in bronze and was temporarily set up in an archway outside the duke's home, Milan Castle. Its fate is one of the sad stories in Italian history. Sforza's enemies, the French, had long been threatening him; now they besieged Milan, and the equestrian statue was demolished by the archers of Louis the Twelfth.

LEONARDO MOST LABORIOUS WHEN HE WAS MOST IDLE

While Leonardo was busy on this group, however, he executed a great number of commissions, and among them the very important painting of the Last Supper on the walls of St. Maria delle Grazie. The artist received the order to execute this work with something approaching ecstasy; here was a subject he had yearned to paint. He made a great number of chalk studies, and the remnants of these are now widely scattered, the best being in the Accademia of Venice, and some rather fine heads in the library at Windsor. South Kensington Museum treasures some notes made by the artist describing the various attitudes and expressions of the Apostles.

Presently Leonardo began the actual painting, and soon was standing before it in his characteristic attitude of self-distrust and fastidious criticism, an ever-forward reaching to the ideal which was secret to his own soul, and was to his work what the Sun is to the Moon.

Seized by an access of vigour, he would toil from dawn to dusk without food. Then there would come on him strange moods when he would stand motionless, staring at the composition for an hour or two; and after this spell of thought he would leave the painting untouched for several days. When questioned on these habits by the Prior, who, good man, thought the artist was merely wasting time, Leonardo explained that when he was most idle he was really most laborious.

RAGS AND TATTERS OF GREATNESS CLING TO THE FRAGMENTS OF A PICTURE

For several years Leonardo divided his energy between The Last Supper and the equestrian statue. Sometimes the artist was seen to leave the group at Milan Castle and walk through the town in the hot midday to the convent beyond the gates. There he would add a few illuminating touches to the painting, and return to the castle.

In 1498 the picture was finished. It is our irreparable misfortune that the artist, refusing to work in fresco, which does not admit of the constant retouching that his ideals demanded, painted in oils on the stucco surface of the wall. In a very short time the fabric crumbled, and the picture stands now in ruin. Although many copies have been made, the rags and tatters of greatness clinging to the fragments of the original make the finest of them seem a sorry imitation.

The other most talked-of picture by Leonardo is of a very different kind—a simple portrait of a Neapolitan woman, called La Gioconda, and known as Mona Lisa. In this face the artist painted his mastery of knowledge of character.

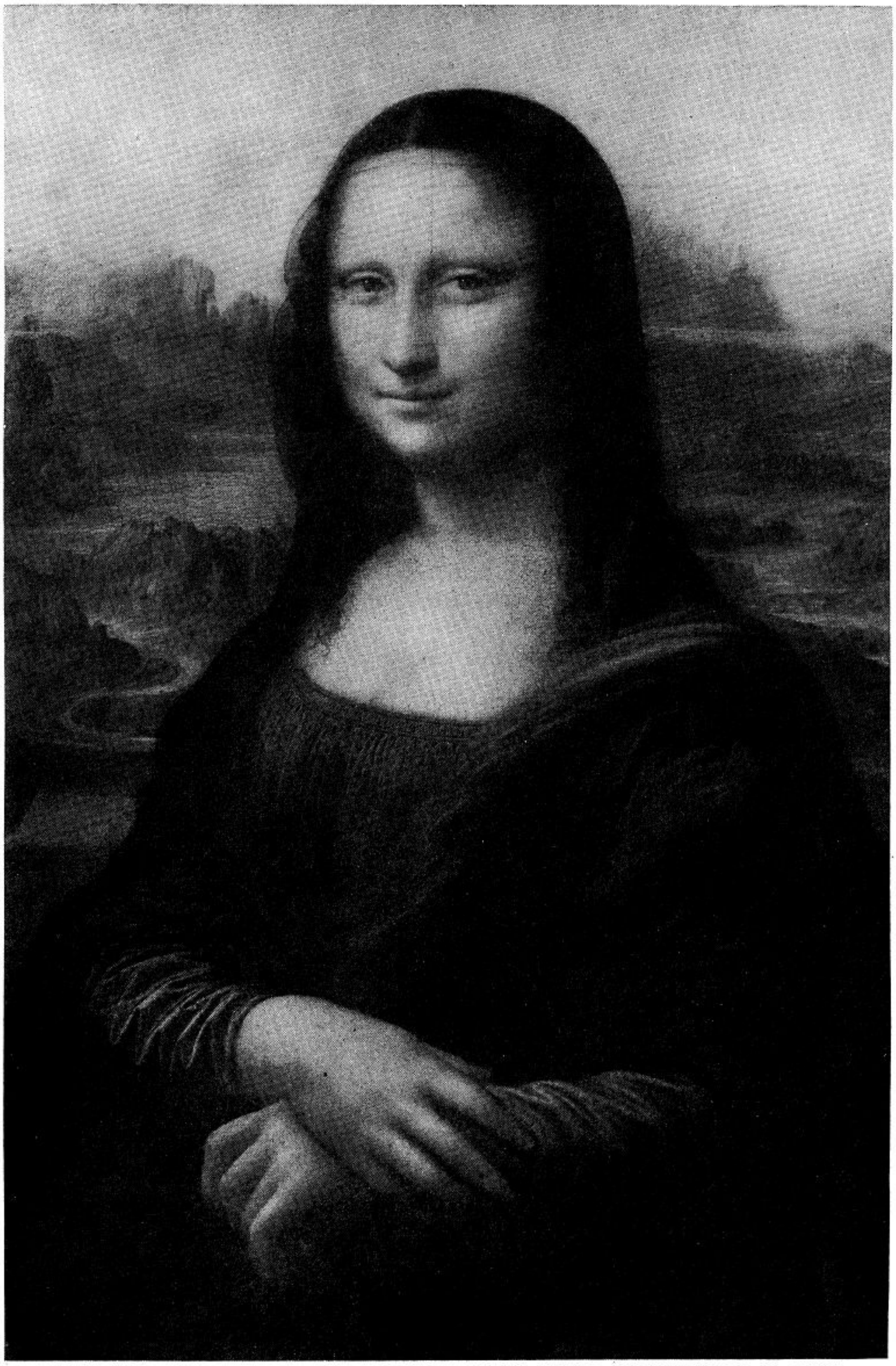
As in the case of the Last Supper, he himself was standing apart, studying, as an intellectual exercise, the human emotions which stamp a face just as much as the definite features do. We can never feel, for instance, that Leonardo liked or disliked Peter or Judas, or liked or disliked Mona Lisa. He was fulfilling what he deemed was the artist's vocation in figure-painting—the delineation of the human soul.

PICTURE THAT MUST HAVE BEEN WORTH 4000 GOLD CROWNS

La Gioconda was just an ordinary woman, and she hid her thoughts under an elusive, inscrutable smile. Leonardo spent four years painting the smile, *and* her thoughts. In its early condition this masterpiece must have arrested all men's eyes, and have been well worth the 4000 gold crowns which Francis the First paid for it when Leonardo took it with him to France. The sky was very blue, and the Neapolitan's face was very fair, with sparkling eyes and pretty, red lips. Even now, with this brightness faded, it is one of the wonders of the world. It fulfils in itself Leonardo's own version of a very much older maxim—Mortal beauty perishes; Art remains.

Leonardo da Vinci is an eternal lesson to young students who want to paint before they can draw. Into the preliminary studies for his pictures he put an immense amount of care, and these charcoal drawings not only foreshadow the paintings but mirror the genius which inspired the artist in all his work.

LEONARDO'S SMILING LADY



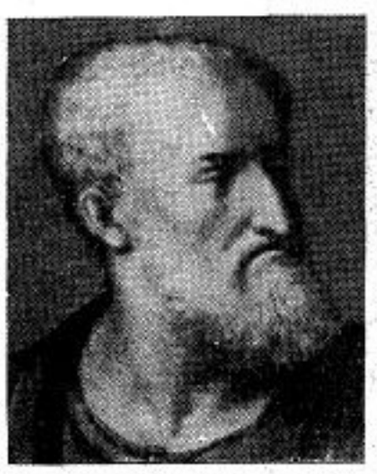
MONA LISA, THE MOST FAMOUS PORTRAIT IN THE WORLD, BY LEONARDO DA VINCI

We have in our possession in England a treasure which many other nations envy, and by some curious fate it is tucked away in a corner of the Diploma Gallery at Burlington House—a collection of pictures very few people go to see. This treasure is a cartoon by Leonardo, one of the studies in charcoal for a Madonna group, now in the Louvre. The pure and lovely face of Mary is Leonardo's conception of the beauty of motherhood. It is the work of a supreme master.

There is a painting in the National Gallery which has long been attributed to Leonardo, but is now believed to be the work of Ambrogio de Predis, one of his pupils. It is called the Madonna of the Rocks, and is a copy of the original picture of this name by Leonardo, now in the Louvre. The French thus own three of Leonardo's four great pictures—the Mona Lisa, the Madonna of the Rocks, the Madonna and Child and St. Anne. The ruins of the fourth, The Last Supper, are still to be seen in the Maria delle Grazie, Milan ; and there also are two disputed portraits by Leonardo—Lodovico Sforza and either Beatrice d'Este or Bianca Sforza.

A great deal of the artist's work was destined to be lost. One of the paintings we should most like to have seen is a battle scene he worked at for some years in Florence. It was part of the decoration of the Council Hall, and the work was entrusted to Leonardo and Michael Angelo. Thus two of the masters of the world, in whose two styles all styles met, were labouring under the same roof. They were already known to each other. Leonardo was over fifty, Michael Angelo still young.

It would be difficult to find two men more differing from each other in the pursuit of a common ideal. There never was an artist who brought less feeling and emotion, and more intellectual force, to bear on his pictures than Leonardo da Vinci ; but in Michael Angelo thought

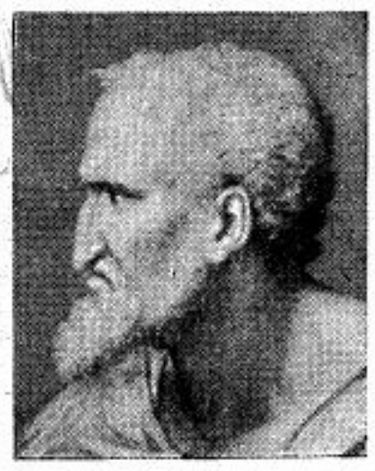


Andrew

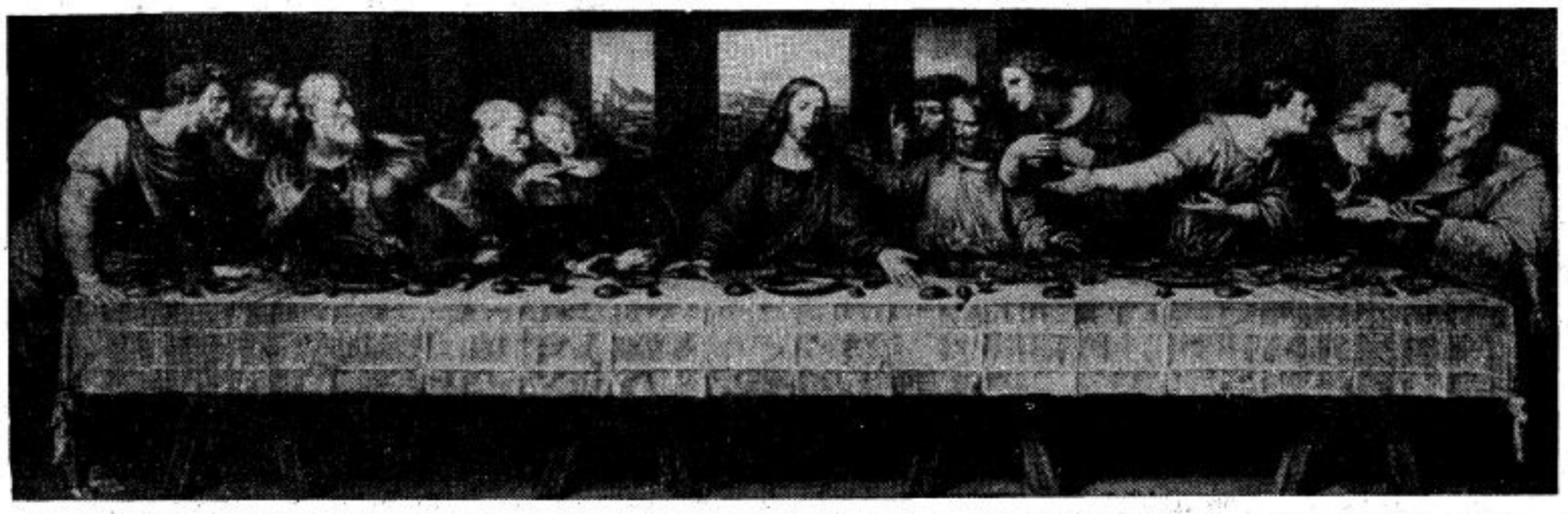
Judas

Jesus

James



Simon

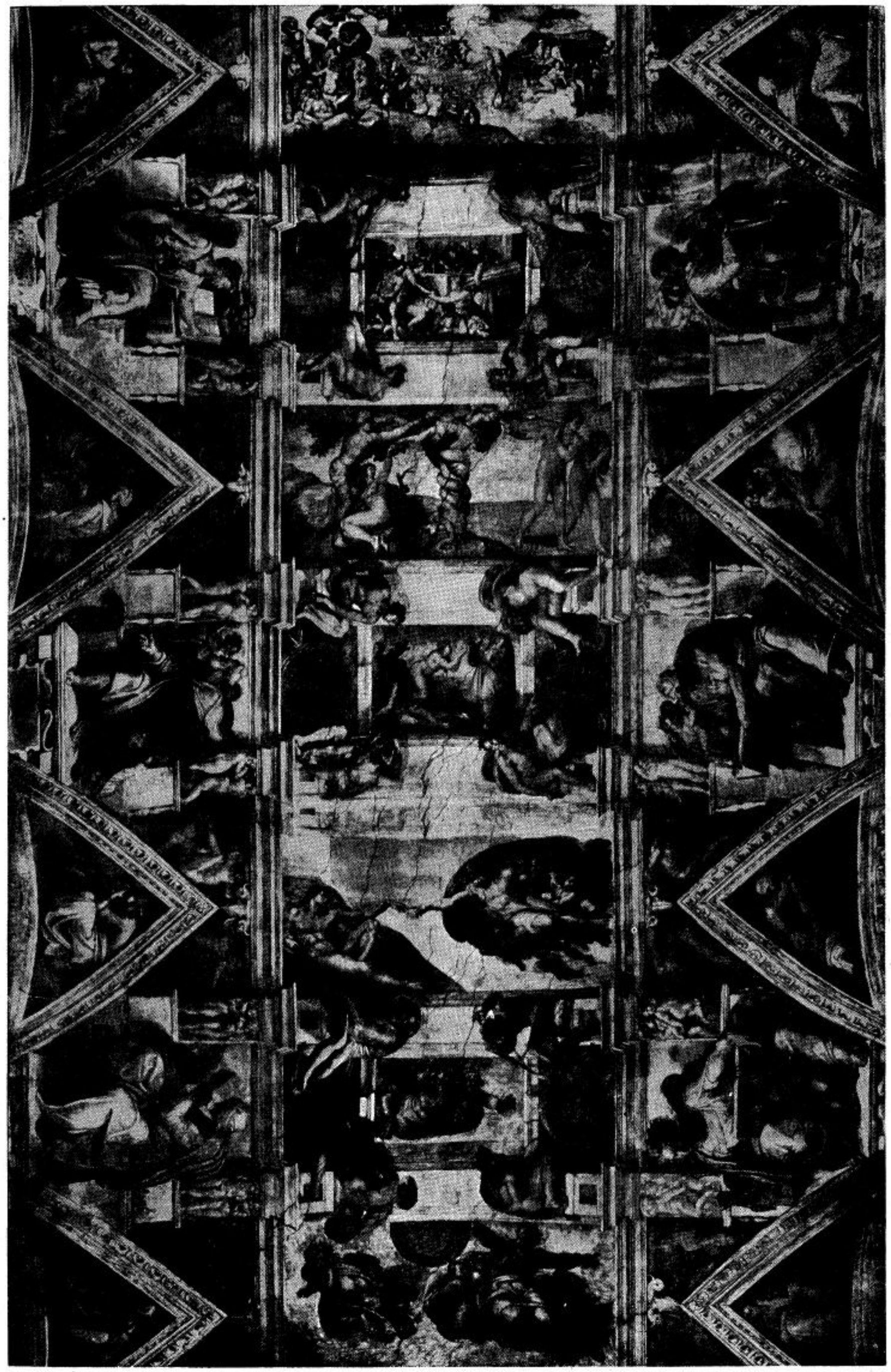


THE MASTERPIECE OF LEONARDO NOW CRUMBLING ON A WALL IN MILAN—THE LAST SUPPER

played little part ; rather he flung his own joy, his own sorrow, into stone and into painted figures, a restless pent-up spirit throbbing its way to freedom. He was essentially a sculptor, and his pictures show his vivid passion for line and form. To him, the body of man was indeed God's greatest work, and he paid little attention to landscape, light and shade, atmosphere, or any other aspect of natural objects.

Michael Angelo, sculptor, painter, architect, poet, was the last of the great Florentines. His work seemed like a mighty challenge to the rest of the world, and, heard across the centuries, those spiritual trumpets are still faintly booming. The old-new Greek culture had laid its hold on

MICHAEL ANGELO'S WONDERFUL CEILING



THE MAGNIFICENT CEILING OF THE SISTINE CHAPEL, PAINTED BY MICHAEL ANGELO, IS ONE OF THE CHIEF GLORIES OF ROME. THIS PICTURE GIVES SOME IDEA OF ITS GRANDEUR, BUT THE VASTNESS OF THE ARTIST'S CONCEPTION CANNOT BE REALLY SUGGESTED ON PAPER.

his imagination ; he had already inherited close on three centuries of Tuscan art : two influences which were like live wires, twisted together, fire-making.

This impetuous and forcible genius was naturally a great leader, and he founded in Rome, where he chiefly worked, a school which influenced the energies of nearly all the artists of Italy.

In the realm of painting, Michael Angelo's greatest achievement was the decoration of the ceiling of the Sistine Chapel in the Vatican. This work he undertook not very willingly, at the command of Pope Julius II in 1508. He said to the Pope, rather querulously, that sculpture, not painting, was his trade, and that Raphael, the painter of Urbino, was much more likely to do the ceiling well. But the Pope insisted—for the great good fortune of us all—and Michael Angelo set to work, only reserving himself the final comment of henceforward signing all his letters, " Michael Angelo, *Scultore.*"

A CHAPEL WHICH STANDS ALONE IN THE NOBLE HISTORY OF ART

It is difficult for people who have not seen the Sistine Chapel to realise this vast piece of painting, which stands alone in the history of art, stupendous, without the shadow of a rival. Michael Angelo accomplished it in four years, almost unaided, as the artists he summoned to Rome to help him did not fulfil his requirements, and he sent them away in disgust.

It would seem to us that the planning of this mighty work alone should have been one man's sole labour. In the central vault of the ceiling are nine large pictures telling the story of Creation, the Fall of Man, and the Deluge. Between the windows, spaces are filled with twelve figures of Prophets and Sybils who are foreshadowing the coming of Christ. In the spandrels are painted stories from the Old Testament, such as the Brazen Serpent and the Death of Goliath. The lunettes are filled with figures of David's descendants, and the ancestors of Mary. These large divisions complete, Michael Angelo used up all possible extra spaces to paint figures of youths and children. There are in all about two hundred figures, of immense size, painted in vigorous and sometimes unusual attitudes, the whole vast work charged with the extraordinary vividness, aliveness, and overweening strength which was the stamp of Michael Angelo's creations. Looked at even now, after a lapse of 500 years, it would seem that those figures in the Sistine Chapel could quite easily step down, make some violent gestures, and speak in a high, heroic way.

THE COLOSSAL SHAPES EXPRESSIVE OF THE ARTIST'S SOUL

When Michael Angelo was about seventy he was ordered to paint The Last Judgment on the wall above the altar of the Sistine Chapel. This, his last fresco work, lacks the fire and force which mark the ceiling decorations, and shows what mannerism without genius can do.

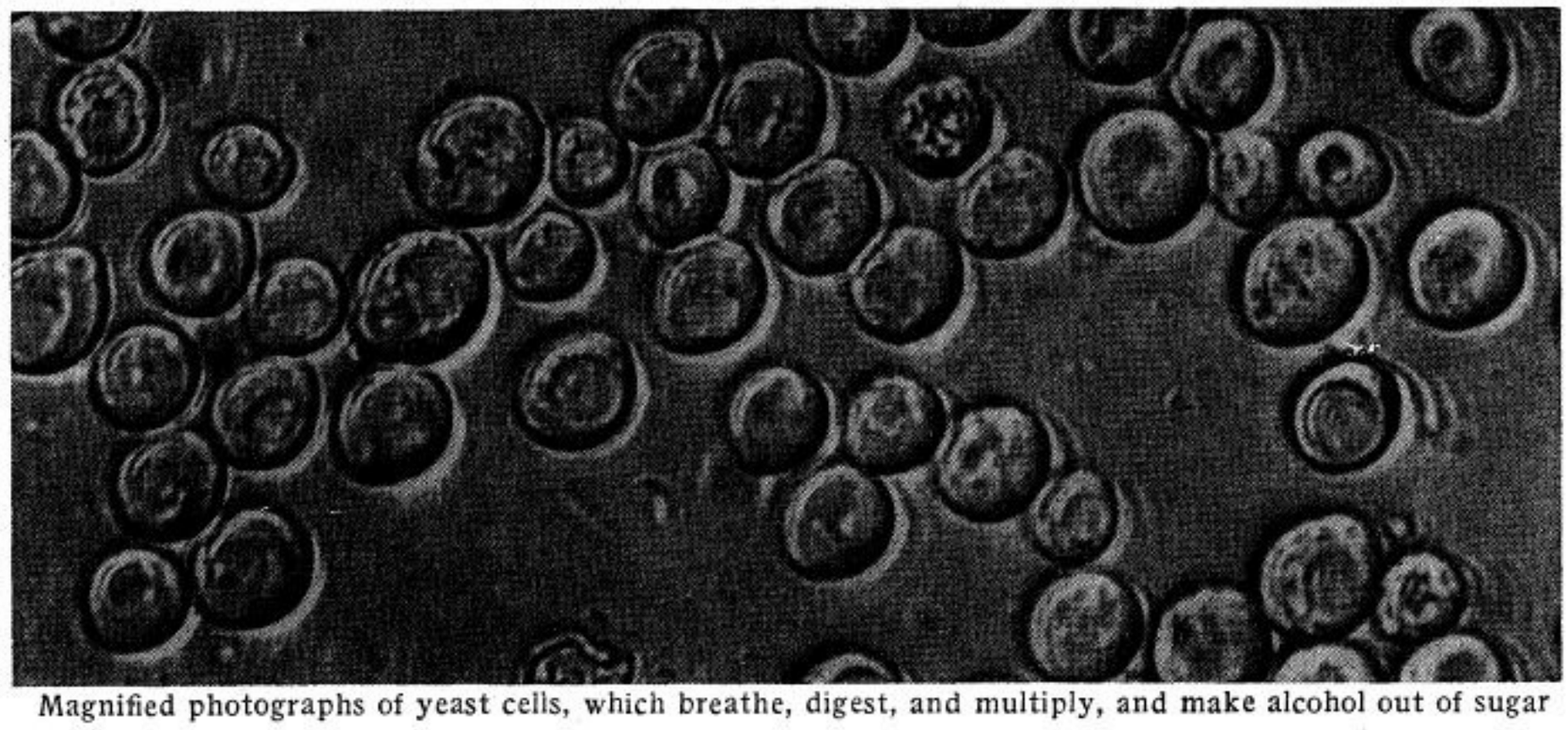
Very few other specimens of the mighty artist's paintings are left for us. He never carried out the fresco designed for the wall of the Council Hall in Florence, where Leonardo was working. The cartoon foreshadowed a magnificence even surpassing that of the Sistine ceiling, but this, like many other treasures, was destroyed. The Deposition in the National Gallery, attributed to Michael Angelo, gives some idea of his wild energy, his Titan-like strength. Another painting of his—the Holy Family—is in the Tribune of the Uffizi Gallery, Florence ; and a very early picture of the same subject is in the National Gallery.

But when we think of Michael Angelo the painter, we think of the solitary and unrivalled magnificence of the Sistine Chapel, and we feel a little awed to think that one human being can be responsible for that immortal grandeur. We think of the artist toiling at the work, often through spells of great physical weariness and despondency, struggling to express his own soul in these colossal shapes.

THE LAST OF THE MIGHTY RACE OF FLORENTINE PAINTERS

His is a sad figure in a century of buoyant, happily-inspired artists. To him genius was indeed the sorrowful gift. By temperament a little unfriendly and irritable, he alienated many people who might have made his life happier. His patrons did not reward him too well ; poverty and family trials burdened him. When he died, an old man of 89, all the rest of his brilliant generation had gone, Raphael and Leonardo over 40 years before. With him died the mighty race of painters who for three hundred years had made the name of Florence famous.

The Wonderful House We Live In, and Our Place in the World



Magnified photographs of yeast cells, which breathe, digest, and multiply, and make alcohol out of sugar

OUR UNSEEN FRIENDS AND FOES

DIFFERENT kinds of microbes have different powers, and act sometimes in useful, sometimes in harmful ways. Some microbes, for instance, have special powers of making food material with the aid of the air which is found down in the soil. Air contains a very valuable element called nitrogen, which ordinary plants cannot use, and which we cannot use, though we breathe it into our blood along with the oxygen which we *do* use. But certain microbes can take this nitrogen and combine it with other elements so as to make compounds which are perfect food materials.

These particular microbes are specially fond of certain kinds of green plants which are not particularly useful in themselves; but the farmer knows that it is worth his while to grow these plants one year, so as to make the soil rich in food for his wheat in the next year. If he grows wheat every year the soil will become exhausted of its food materials, and so farmers have long practised what is called the *rotation of crops*. It is, of course, a very serious matter, for the farmer and for the country, that the farmer cannot grow wheat every year; but it is hoped that by using these special microbes in a particular way we may be able to grow wheat year after year in the same soil.

The dairyman should be no less interested in microbes than the farmer should be, for they are of the utmost importance in all his work. Among them are included his best friends and his most dangerous enemies. If we realise that microbes are everywhere, we shall understand that they invade milk from the moment it is drawn—microbes of all kinds, useful and dangerous, from the air, from dust, and from water.

Now, milk is one of the best things in the world in which to grow microbes, and so those which get into it grow very quickly, for good or for evil. It is the duty of the dairyman to keep out of his milk all dangerous microbes. It is the duty of everyone to know that milk, which is a perfect food for us, is also a perfect food for some of our most terrible enemies, such as the microbe that causes consumption, and the microbe that kills tens of thousands of little babies every summer.

But here we are talking especially about the natural and proper work of microbes. There are quite a number of them which are, in a sense, natural in milk and are known as milk microbes.

They are certain to enter it, and are indeed very useful in it. These microbes exist in enormous numbers in cowsheds, and get into milk soon after it is drawn.

Now, the extraordinary thing about this is that as they grow and multiply in the milk they prevent other microbes which might be bad for us from growing there. In course of time they turn the milk sour, but sour milk is not bad for us, and, indeed, the microbes in sour milk, when they enter our bodies, help to protect us from other microbes which might do us harm. So they are really very good friends of ours, and nowadays, when people suffer from certain kinds of illness, they are sometimes given sour milk to make them better. The microbes in sour milk help us to digest our food, and they prevent other microbes which would hurt us from multiplying in our food after we have swallowed it.

But there is more to say than this. From milk we get cream, and from cream we get butter, but without the proper microbes of milk no butter could be made. It is the milk microbes which cause the cream to ripen so that butter can be made from it.

THE MICROBES THAT HELP US TO MAKE BUTTER AND CHEESE

The flavour of different kinds of butter depends on the particular kind of microbe that ripened the cream from which the butter was made, and nowadays we can cultivate just those kinds of microbes which help us to make butter with the kind of flavour people like. As the microbes start the process of butter-making, they are called " starters," and in some parts of the world men of science supply the best kind of " starters " to farmers to ripen their cream with.

Just as we could not have butter without microbes, so we could not have cheese. All cheese, of course, is really made from milk, and the milk produced by any particular kind of animal such as the cow is the same all the world over. Yet there are dozens of kinds of cheese, and their differences mostly depend on the particular kind of microbe which is used in their manufacture.

We owe our boots to microbes, too. Boots are made of leather, and all leather is made from the skins of animals by a process called tanning. But tanning would be impossible without microbes. Nor is this all. Every great city has to deal with the problem how to dispose of its waste matter, and one of the best ways of dealing with sewage is by using microbes to do the work.

We see now that the tiniest of all living creatures play a great part in the world. Especially marvellous is the way, as we have already read, in which they destroy all dead creatures, animal, vegetable, and even human, so as to make room for those who are now living and those who yet shall be ; and, more than that, turn the stuff of which these millions of dead bodies are made into fresh, wholesome, and pure food material to nourish the life of the Earth.

THE MICROBES OF THE PAST THAT LEARNED A LESSON

But we must be quite fair, of course, in talking about microbes. There are a certain number of microbes that live, not on dead matter, but in and upon the bodies of creatures that are still alive. Probably all microbes began by living on dead matter, but some of them learnt how to attack the bodies of very old or nearly dying plants, or animals, and so at last there were produced the present race of microbes which invade the living bodies of higher creatures and are a scourge and a menace to mankind.

Plants and animals and men may all suffer in this respect ; but it is very interesting for us to learn that when creatures live wild, in their natural state in the open air of heaven, and in the light, they suffer little from microbes.

Wild animals and wild plants scarcely suffer at all. But when man takes various kinds of plants for his own purposes, and grows them in conditions which are not really natural, they are often attacked by microbes ; and it is the same with domesticated animals.

MICROBES MORE DESTRUCTIVE THAN SNAKES AND TIGERS

This is a lesson for us. If wild creatures were meant to live in fresh air with the sky as the roof over their heads, so also were men and women ; and if we shut ourselves up, as we sometimes shut up cows and tigers, microbes will attack us, just as they attack them. The kinds of microbes which are useful to us, such as those that keep the earth sweet, those that help plants to grow, and so on, can thrive in the open air, and the light of day helps their work ; but the dangerous microbes, and especially the microbe of

consumption—which kills far more human beings every day than all the snakes and tigers in the world kill in a year—are themselves killed by open air and sunlight.

There are houses in our great cities, and even in country places, with windows made so that they cannot open ; there are thousands of rooms with no windows at all, lit artificially all the day. No human being should live in such a room ; microbes are almost certain to catch him and kill him. It should be a crime to make a room like that.

THE FRESH AIR THAT SAVES THE ZOO MONKEYS FROM CONSUMPTION

We cannot do without air and sunlight ; we must not be packed too closely together; and if we obey these laws microbes will scarcely injure us. If we can save the monkeys at the Zoo from the microbes of consumption by keeping them in fresh air (as we do), we can also save each other in the same way.

One of the most important of these microbes is not usually called a microbe, but it might well be so called, for it is a close relative of microbes and lives in the same fashion.

This is the yeast plant, which turns sugar into alcohol and the gas called carbon dioxide. We use it every day in making bread. The alcohol is blown away as a gas, and the carbon dioxide forms in the flour and makes the bread rise.

But we also use the yeast plant to get the alcohol that it makes. This also is a very useful substance ; it is used in hundreds of arts and industries ; it is splendid for cleaning things and for preserving them ; it burns beautifully and makes a splendid fuel ; it is, perhaps, the cheapest and most easily made of all fuels for many purposes. It is far cheaper than petrol, and one day will be used to drive engines. So, if we had the sense to know how to use alcohol in useful ways, the tiny yeast plant which produces it would be among the best friends of man.

ALCOHOL A POISON FOR ALL LIVING CREATURES WITHOUT EXCEPTION

But men drink alcohol, *which is a poison to all living creatures without exception, men or animals or plants.* It is even a poison to the yeast plant that makes it, and when the amount of alcohol in the sugar which the yeast plant is feeding upon and changing rises to a fixed point, the yeast plant is killed, and if the process is to go on the alcohol has to be taken away as fast as it is made.

Alcohol is of no use to our bodies, but in time will cause disease in every part of them, especially the brain, which is the most important part of us. It is the great friend and ally of the microbe of consumption, for which it prepares the way by *making our bodies unable to resist it.*

In various ways, even when taken in moderation, alcohol reduces our power of fighting the deadly microbe. For it diminishes the vigour of activity of the white blood-cells which are the soldiers and scavengers of the body ; it diminishes the power of the digestion and is apt to cause inflammation of the membrane of the stomach ; and it damages the delicate nerve tissues.

We can usually find the microbe of consumption in abundance in public-houses, because many people who suffer from consumption spend much of their time in public-houses, and there the microbe attacks new people who are made ready for it by alcohol. Especially does this apply to young men and young women who spend their time in microbe-infested public-houses when they should be playing games or taking long walks in the open air.

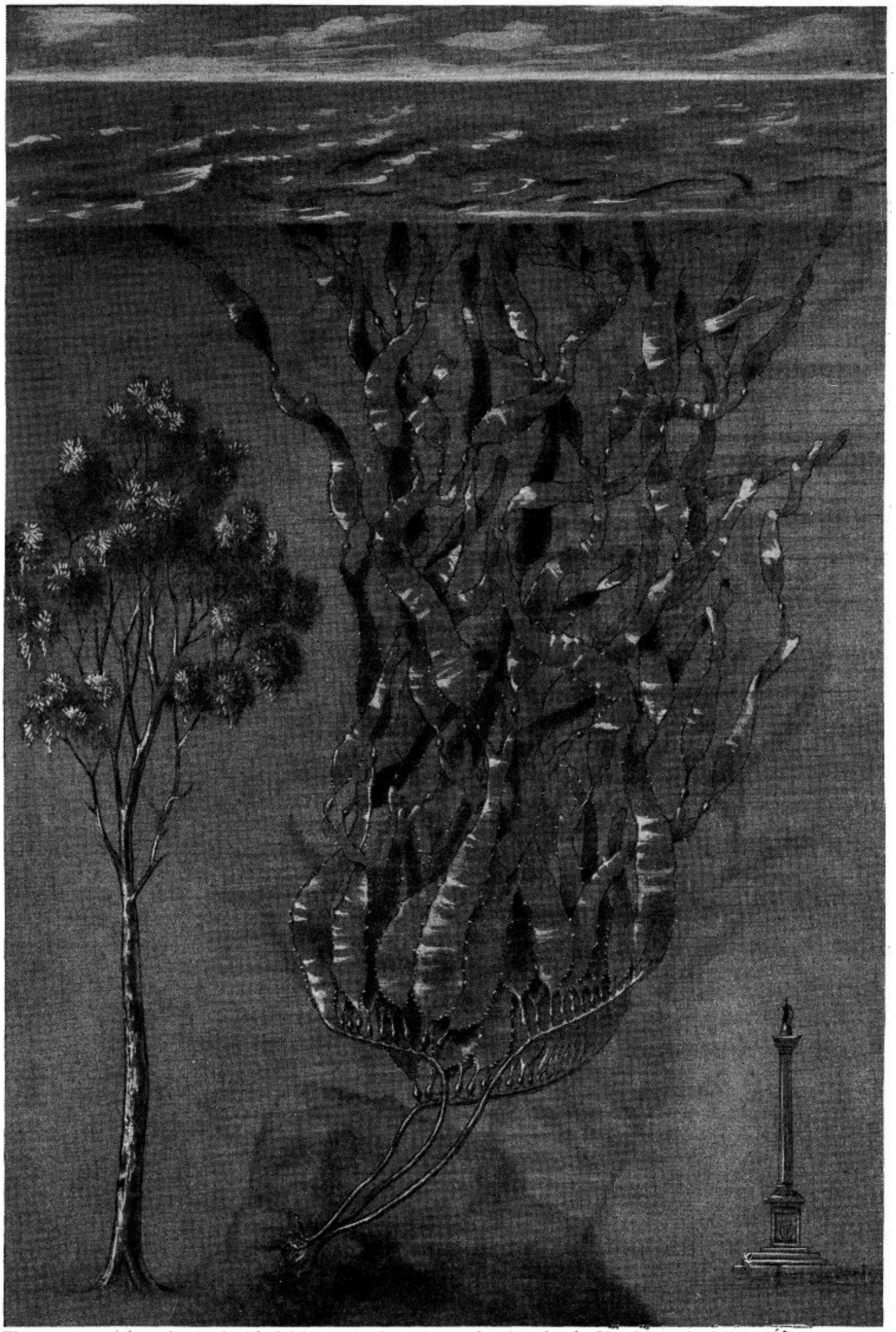
CONSUMPTION THAT SLAYS 50,000 ENGLISH PEOPLE A YEAR

The microbe of consumption was found in the last half of the nineteenth century by a great German called Koch, who took up the work of the Frenchman Pasteur—the first man to understand and tell us about microbes. Between fifty and sixty thousand people are killed by the microbe of consumption in England every year. All over the world, wherever men are crowded together, this microbe destroys them ; but one day we shall make an end of consumption by attacking its great friend alcohol.

Probably the microbe of consumption is one of those microbes which can scarcely live at all except in the bodies of other living creatures, such as ourselves, and so, when we prevent it from attacking us, it will no doubt die out altogether. We shall destroy it as our ancestors destroyed wolves.

But let us not forget that, though some microbes do us harm if we let them, and though some microbes kill us, yet without microbes we could not live at all

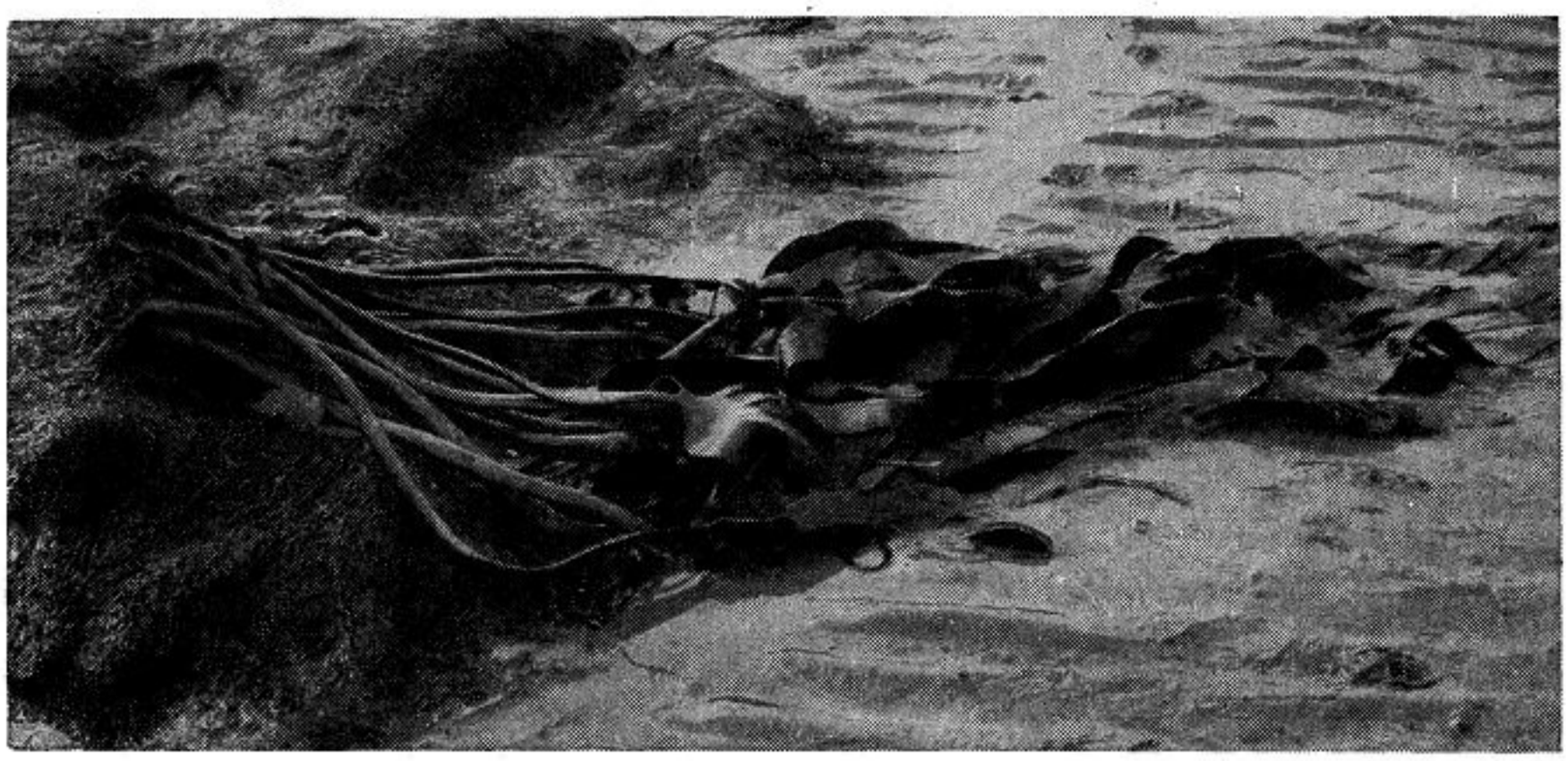
THE GREAT PLANT CLIMBING IN THE SEA



The most amazing plants, for their size, grow in water and not on land. Shackleton's ship, the Quest, found gigantic marine forests near Tierra del Fuego,and soundings showed that some of the monster seaweed plants peeping above the water were 600 feet high, over 100 feet taller than the tallest land tree—the Australian eucalyptus, which sometimes reaches 500 feet. Nelson's Column, 145 feet high, is also shown at the side.

PLANT LIFE

The Story of the Marvellous Plants that Cover the Earth



PLANTS AND THEIR ANCESTORS

How living creatures began to be we do not know, but some of the great events in their history are clear.

It is almost certain that plants got the start of animals, for plants are able to feed on air, water, and salts ; while animals are seldom able to feed at such a low level.

It is almost certain that the first thoroughly successful creatures were microscopically small, that they swam about in the sea by means of a vibrating lash of living matter, that they possessed chlorophyll or some other colouring matter which enabled them to use the power of sunlight, and that they were nearer to plants than to animals.

Whenever and wherever well-lighted shallow waters were established, some of the pioneer free-swimming plants would anchor themselves, and thus began the history of fixed seaweeds. When we look at the beds of seaweed exposed at low tide, we are looking at a very old type of vegetation ; and it may be that some of the beautifully coloured and moulded kinds are extremely ancient forms of life.

When there was a buckling of the floor so that continents and ocean basins were established, and when the shores were slowly raised, as often happens, it is possible that some of the seaweeds were gradually transformed into land plants, getting true roots for absorbing water and salts from the soil, and true leaves for absorbing gases from the air. Or it may have been that some of the simple plants of the sea made their way up estuaries to rivers and lakes, and, after sojourning in swamps and marshes for ages, began at last to colonise the dry land.

Some of the liverworts of today may be representatives of the ancient pioneers. In any case the rock-story does not show any fossil land plants in the earlier strata, while there are plenty of traces of seaweeds, so that it is safe to conclude that plant life was at first aquatic. We may perhaps picture three great epochs.

1. The primeval Open Sea, teeming with small swimming green plants.

2. The floor of the illumined Shallow Sea, with anchored fronds, making endless experiments in body-building, and in securing the continuance and spreading of their race.

3. The beginning of land vegetation, either from transformed seaweeds, or from active migrating plants which came on to dry land by a freshwater route.

In each age some kinds made themselves more and more at home where they were, while others pushed on to new adventures and conquests.

The simplest plants that live an independent life are among the seaweeds or the

algae. Such are the diatoms, single-celled plants with beautifully sculptured shells of flint, which abound both in fresh and salt water. Such are the tiny plants that form a green coating on the windward side of trees and gate-posts, coming off on your fingers like wet paint.

But many of the seaweeds are very far from simple, and among the brown ones especially we find mimic roots and stems and leaves. The root, however, is only a holdfast, an anchor, and the leaves (or fronds) absorb water, not gas. In the brown seaweeds there is chlorophyll as in the green ones, but some yellow pigment is added. In the red seaweeds, though one can hardly believe it, there is chlorophyll again, but it is masked by an entirely different red pigment, which may perhaps help the plant to make more of the very blue light of moderately deep water.

On the shore the green seaweeds are most abundant in the shallow water, and red ones in the deeper water ; the browns, like the bladder-wrack, are in between. Waving about like flags in the water are the great tangles, but we do not see much of them except at the very lowest tides. One of the giant tangles, much burned to yield potash and iodine, has a stem a hundred feet long and fronds of several hundred feet. In actual length these kelp-tangles exceed the height of the Big Trees of California, but they have no strength of tissue ; they float in the water, buoyed by numerous gas-bladders.

THE PLANTS THAT FEED ON OTHER PLANTS OR ANIMALS

Parallel to the seaweeds or algae are what we call the Fungus family—moulds and mildews, mushrooms and toadstools. They are without chlorophyll and cannot live an independent life. Many of them feed on rotting matter ; the others prey on living plants or animals. The simplest kind of fungus is the almost ever-present bacteria, single-celled plants of very small size, which are the causes of all rotting, of some kinds of fermentation, and of many diseases, such as plague, cholera, and tuberculosis. Many of them, however, are useful, as we read elsewhere.

A very interesting position is that of the encrusting lichens which we see on stones and trees, for they are " double plants," consisting of an alga and a fungus living together in a partnership that helps both. The fungus-partners serve to fix and to shelter ; and they absorb the water and salts. The alga-partners have chlorophyll or some allied pigment and are able to build up carbon compounds. It sometimes happens that the fungus-partners get the upper hand and absorb the algae, but this means putting an end to their own existence, for they cannot continue long without their green allies.

THE PARASITE WHICH FORCES THE GREEN ALGAE TO BE ITS SLAVE

One of the discoverers of the secret of lichens writes of them very vividly :

> The master is a fungus, a parasite which is accustomed to live upon others ; its slaves are green algae, which it has sought out, or indeed caught hold of and compelled into its service. It surrounds them, as a spider its prey, with a fibrous net of narrow meshes, which is gradually converted into an impenetrable covering ; but while the spider sucks its prey and leaves it dead, the fungus incites the algae found in its net to more rapid activity—indeed, to more vigorous increase.

It should be mentioned here that in the lichens it is the fungus-partner that produces the spores, but the algae enter into the partnership almost from the very first. Lichens may be flat, or tufted, or hairy ; and their colours are often fine. Reindeer moss, on which reindeer largely depend, is a lichen ; and so is Iceland moss, which is used in making a delicate food for invalids. Another interest of lichens is that they do a good deal in the way of weathering the rocks and beginning the formation of soil on the mountain-tops.

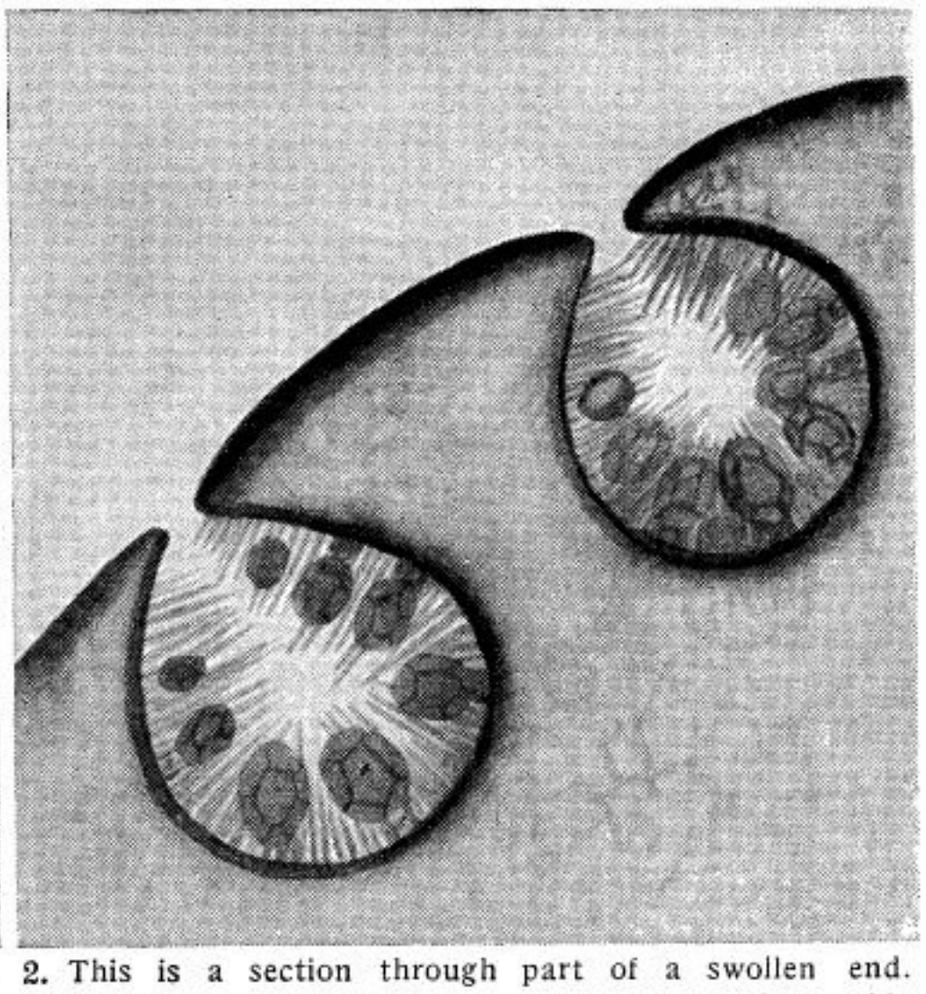
Lichens are a by-way in evolution, they do not lead on to anything else ; and, of course, the moulds and mildews and mushrooms and other funguses cannot be considered as leading to the higher plants, for they do not live independently. Therefore, it must be supposed that the next step in evolution, after the seaweeds, was that which led to liverworts and mosses.

THE MYSTERY IN THE KNOB AT THE END OF THE STALK

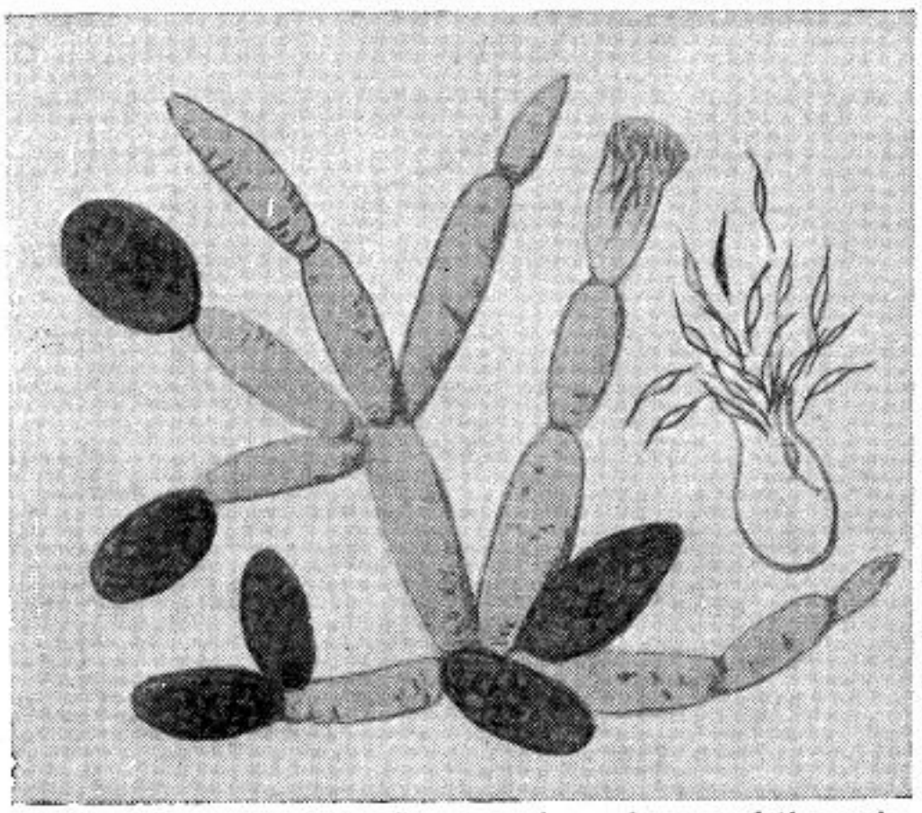
Spreading on moist banks of clay, or on the rocks by the side of a waterfall, there are often flat, sprawling green liverworts. Many of them do not get beyond the level of prostrate fronds, but others are divided into lobes, which look like attempts to make leaves. These are often very well ventilated and provided with numerous internal spaces, in which the work of building up carbon compounds goes on effectively, though the light of the places where the liverworts flourish is often very dim. The liverworts make spores inside

THE LIFE-STORY OF A PIECE OF SEAWEED

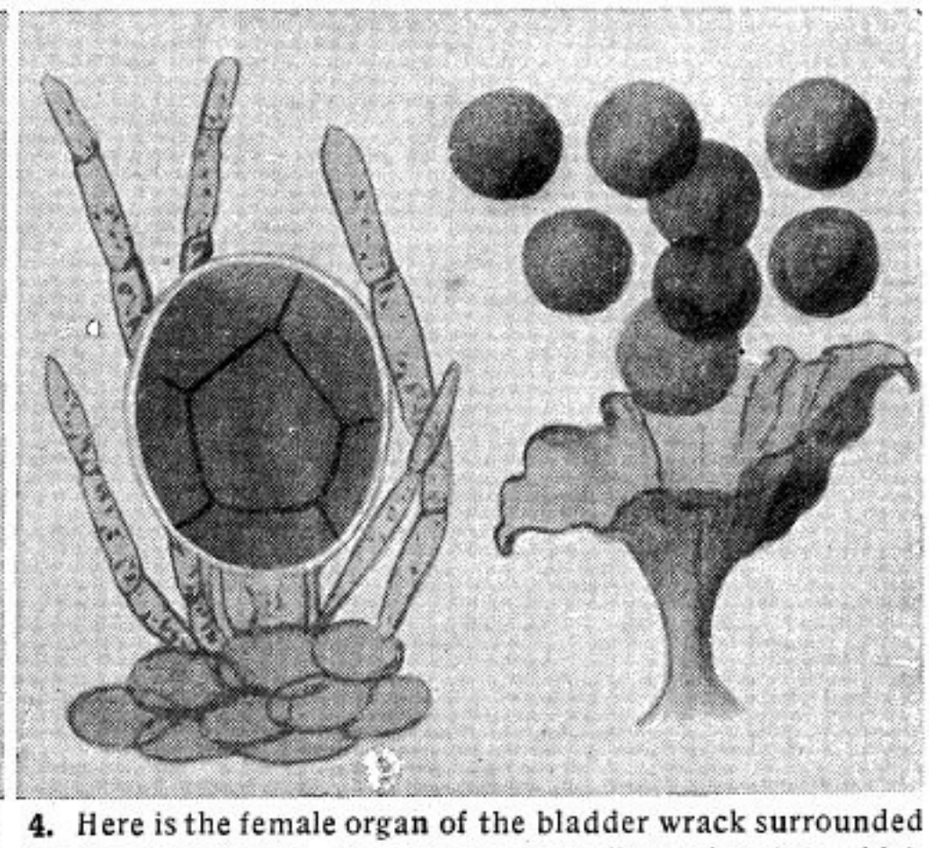
1. This is the common bladder wrack seaweed of our island coasts. Air bladders enable it to keep floating, and the ends of some of the branches are swollen and fitted with little dimples called conceptacles.



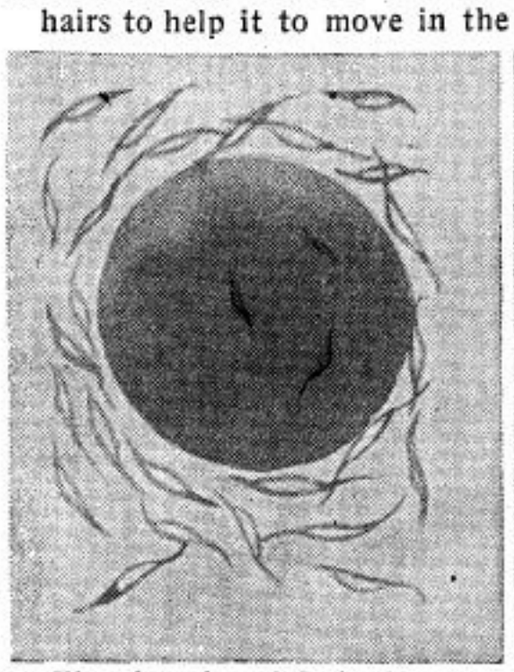
2. This is a section through part of a swollen end. showing two of the dimples. It will be seen that inside each is a mass of hairs which are the male organs of the seaweed. and globular bodies. which are the female organs.



3. The male organs branch out as shown here, and the ends swell and become filled with yellow grains. When ripe the ends burst, and the grains, each with a pair of tiny hairs to help it to move in the water, are thrown out.

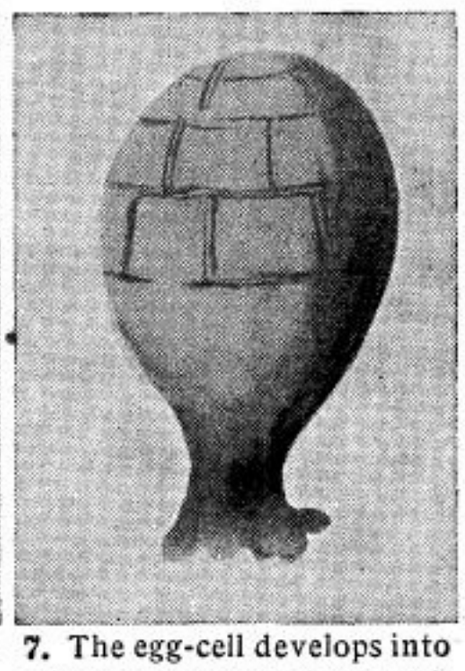


4. Here is the female organ of the bladder wrack surrounded by the male hairs. It contains eight little globules, which it discharges into the conceptacle, and then into the sea. On the right we see the globules escaping.

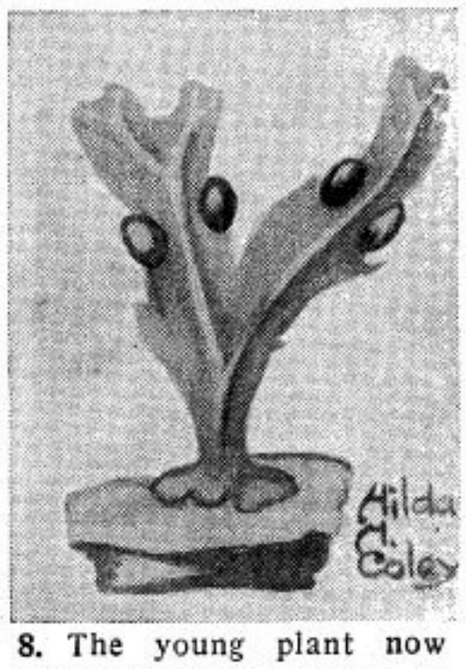


5. The female globule is now surrounded by the male grains, which are enabled to move about by hair-like attachments.

6. The male and female parts blend and form a fertile egg-cell ready to germinate.



7. The egg-cell develops into a young seaweed plant, with a tapering end, which grows sucker-like attachments.



8. The young plant now grows and branches, as shown here, and at last becomes a mature plant.

a knob on the end of a delicate stalk ; and these spores, falling on the damp ground or carried away by water, develop into liverworts with male and female organs. From the fertilised egg-cell, the spore-making generation arises.

Fond of moist and shady places, mosses are among the most beautiful of plants. They are very delicate—sometimes like tufts of hair, sometimes like prostrate feathers, sometimes forming spongy cushions, as in the well-known bog moss. They are what might be called sociable, for if there is one there are many. They soon fill up any suitable place ; they multiply quickly, and even a detached fragment can grow into a complete moss. Although they prefer moist places, many of them are able to survive on dry walls or tree-trunks. They can be dried till their leaves are crisp, but a heavy shower puts them right again. They absorb water by their whole green surface, and also by thread-like rootlets that fix them to their station. They form a class of pygmies, but they often show a considerable advance on the liverworts, having short stems and numerous leaves.

HOW THE EGG-CELLS OF THE MOSSES ARE FERTILISED BY SWIMMING CELLS

If we peer into the top of a vigorous moss-plant, we may see the male and female organs, which are sometimes, not very happily, called moss-flowers. The microscopic egg-cell, which lies in the recess of a body shaped like a flask, is fertilised by a swimming male cell, and the result of the fertilisation is a spore borne on the tip of a delicate stalk. Thus there are two generations, the ordinary leafy moss-plant, which has male and female organs, and then the spore-producing generation. The strange thing is that the second generation grows on the shoulders of the first. When a ripe spore-cell is carried from the burst capsule by wind or water or insect, and lights on a sudden moist place, it grows out into a delicate threadwork, and from this there arises the leafy moss-plant.

This complicated life-history is called *alternation of generations*. In one of the cave-mosses, where the light is very scanty, the threadwork gives out an emerald light, some of the cells acting like reflecting mirrors.

The liverworts and mosses are the simplest land plants of today, but there is no reason to believe that they led on to anything higher. To get on to the main line of ascent we must go back to the sea-weeds from which the ferns made a fresh start in life.

It may be that this is the Golden Age of ferns, for there are as many living now as there have been in the past, and far more than in the ancient days of the Carboniferous Era. They are very varied, from delicate filmy ferns, which one might almost mistake for mosses, up to bracken six feet high ; from the delicate maidenhair ferns on the wall to giants like the royal fern and the tree ferns. There are some 7000 different kinds, and they range from the Tropics to the Arctic. They show a great advance on mosses, for they have numerous vessels for transporting fluid materials within the plant.

THE LITTLE PLANT MANY PEOPLE HAVE NEVER SEEN

When we look on the under side of the fronds of a fern we see brown spore-making organs, and it is often easy to dust our hand with the minute spores or fern seed.

When a spore of a fern lights on suitable moist soil it develops into a little plant which many people have never seen. This bears the male and female reproductive organs, and from its fertilised egg-cell there develops the spore-making fern plant.

In the time of the Old Red Sandstone the most prominent plants were ferns, horsetails, and club-mosses, along with some relatives of these. which are known only as fossils. There was a great vegetation of flowerless spore-plants, and it was from this stock that there arose the seed-plants, which by and by conquered the whole world.

FERNS AND MOSSES AS ANCESTORS OF FLOWERING PLANTS

It is a complicated story, and most of the chapters are still unread, but the main thing is that in very early times—probably in the age of the Old Red Sandstone—seed-plants arose from the great stock to which ferns, horsetails, and club-mosses belong. In the flowering plants that we are familiar with there are two kinds of spores, just as there are in water-ferns and some club-mosses—one kind of spore is represented by the pollen-grains produced by the spore-making organs we call stamens ; and the other kind of spore is known as the embryo-sac, and is formed inside the spore-making organs we call *ovules*.

But the pollen grain (as we call the small spore of the flowering plant) contains, when ripe, three cells, and that is all that is left of the male generation. These three cells pass down the pollen tube which grows from the pollen grain when it is landed by wind or insect or otherwise on the tip of the pistil ; and one of the three reaches the egg-cell inside the embryo-sac and fertilises it, so that a young plant begins to develop. It is interesting that in cycads, and in the maidenhair tree, the fertilising male cells should still be free-swimmers with many lashes, harking back to the free-swimming male cells of the great fern alliance. This is a straw which shows how the wind has blown.

THE EMBRYO AS THE GRANDCHILD OF THE PLANT IT GROWS ON

Turning to the other side of the flower, we find that the spores produced by the ovule are four embryo-sacs, one of which survives. This produces eight cells, and one of the eight is the egg-cell, which develops into a young plant in an ovule, and is called the seed. But, as Dr. MacGregor Skene says in his delightful book on Common Plants, " the embryo is not the child of the plant on which it grows, by which, in the early stages of its life, it is nourished ; it is the grandchild. Between the two there is an intermediate generation, reduced to a few cells, never having an independent existence, but still recognisable."

All this is difficult, but it is worth puzzling over, for it clears up the pedigree of plants in a wonderful way.

The passage from an ancient fern-stock to flowering plants was doubtless bound up with a more thorough conquest of the dry land, and with the more thoroughly aerial mode of life there came an elaborate protection of the offspring. The egg-cells and the embryos are carefully hidden away ; the delicate offspring is bound in a close union with its parent ; it is nursed, protected, and endowed with a legacy ; and there are all sorts of arrangements securing that the seed is well scattered.

THE SEEDS THAT DRIFT ABOUT IN THE WIND

The young plant gets a good send-off in life. While the ancient spore-plants were spread abroad by spores, their successors, the seed-plants, are spread abroad by seeds ; and this is the surer way.

In the geological Middle Ages (called the Mesozoic) there was a great wealth of cycad-like plants, along with their predecessors—the ferns, horsetails, club-mosses, and the extinct relatives of these. The cycads, the maidenhair trees, and the conifers are true seed-plants, but they do not quite rise to the level of flowering plants. In a pine tree the female cones bear on the upper surface of each scale two ovules which are quite naked. In early summer these scales open, and the pollen grains--each of which has two air-bladders, or floats—are drifted by the wind and caught in a drop of sticky fluid on the tip of the exposed ovule. It is not till the next summer that the fertilisation of the egg-cell takes place, and it is not till the third year that the winged seeds are liberated and borne about by the wind.

The true flowering plants are divided into two great classes, the Dicotyledons —such as buttercups, chickweeds, roses, and daisies; and the Monocotyledons—such as the lily and the daffodil, the orchid and the grass. Probably dicotyledons came first.

THE FLOWERING PLANTS THAT SURVIVED THROUGH CARING FOR THEIR YOUNG

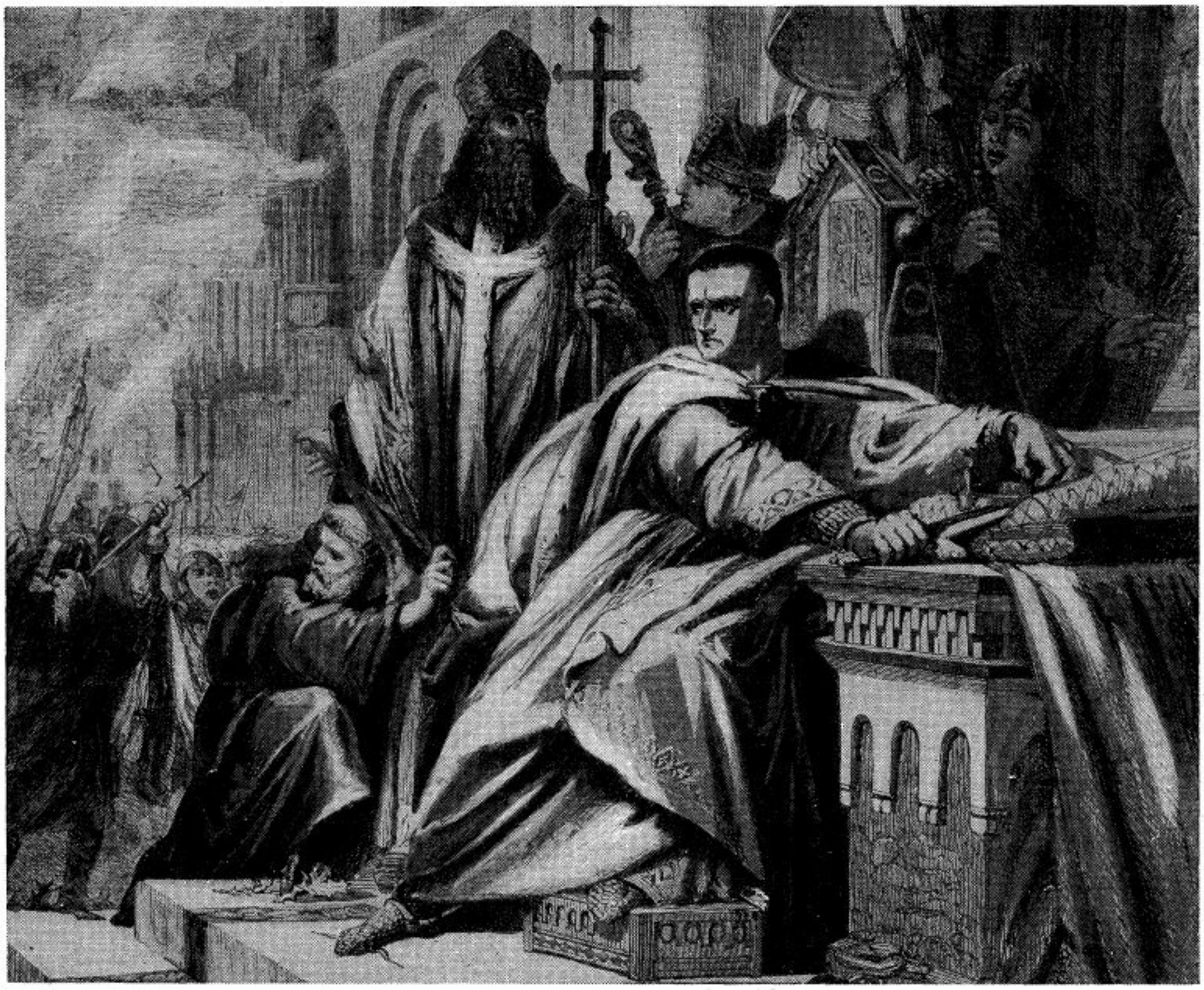
Now in the monocotyledons the leaves usually show a number of large strands joined by delicate cross connections ; in dicotyledons the strands or bundles usually form a more noticeable network. The stem of a dicotyledon can go on growing in thickness indefinitely, but in most monocotyledons the stem does not increase in diameter after it is formed. Everyone is familiar with the tapering stem of an ordinary dicotyledonous tree, and the cylindrical stem of a monocotyledonous tree such as a palm. Finally the parts of the flower in monocotyledons are usually in threes, while the others are usually in fours or fives.

It may be of interest to notice a Census of the Vegetable Kingdom taken by Professor Vines in 1900.

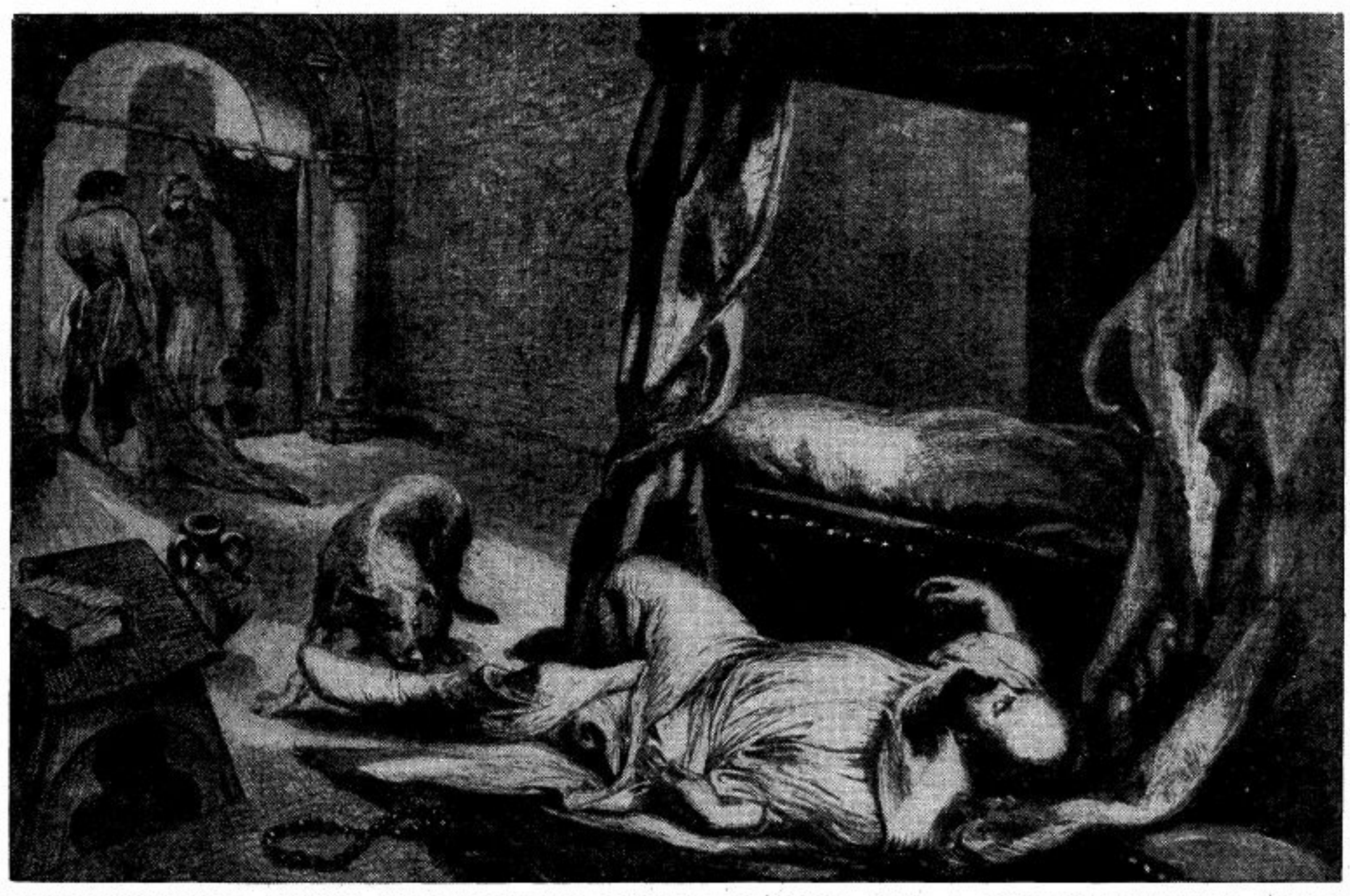
Group	Kinds
True Flowering Plants	103,000
Funguses and Bacteria	40,000
Seaweeds or Algae	14,000
Mosses and Liverworts	7500
Lichens	5500
Flowerless Plants with vessels	3500
Naked-seeded Plants	2500
Total	176,000

The large number of parasite plants is striking ; but the greatest fact is that the Flowering Plants, with their very great care for the young, have been the great conquerors of the plant world.

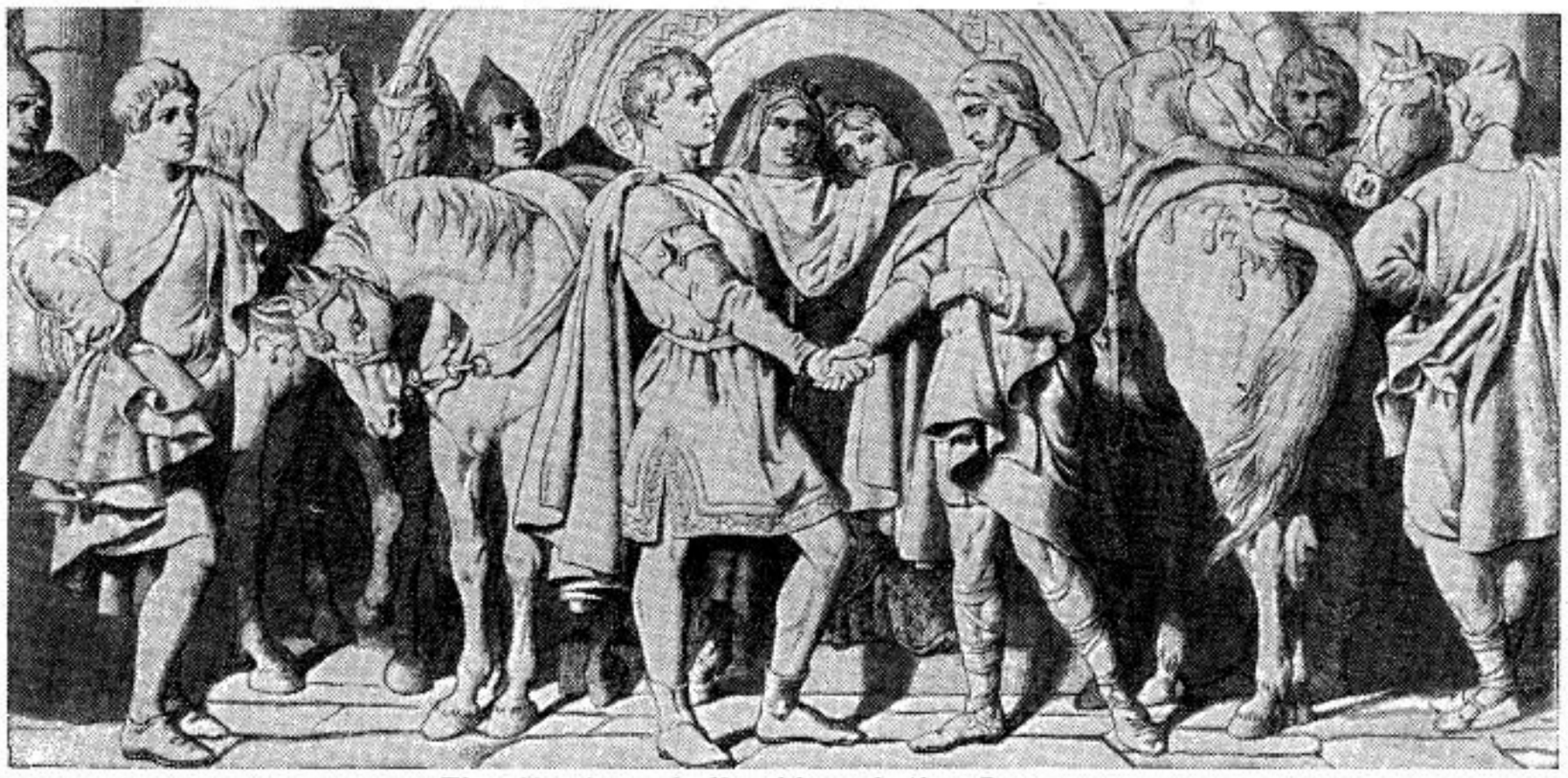
CROWNED IN ANGER, THE CONQUEROR DIES ALONE



THE ANGER OF THE CONQUEROR AT THE MURMURING OF THE PEOPLE DURING HIS CORONATION



THE CONQUEROR, ROBBED AND DESERTED BY HIS SERVANTS, DIES A LONELY DEATH IN ROUEN



The Meeting of Harold and the Conqueror

THE CONQUEROR COMES

Now, when bands of Northmen were plundering and wasting England and Scotland, others went to the northern shores of what is now France, then the land of the Franks—formerly Caesar's Gaul—and settled there in the reign of Alfred. They gained the whole of the beautiful province called after them—Normandy, the land of the Northmen. They very soon left off speaking their own language, and learnt that of the Franks, which we call Norman-French.

These men were bold and very fierce, and they determined to take and keep all that came in their way. Their rulers were called Dukes. Emma, the wife of Ethelred the Unready, was the daughter of one called Richard the Fearless. Her son, Edward, was brought up in Normandy, after the family fled from England on account of the Danes, and as he grew up in a monastery he cared more for a quiet, learned life, and for attending services in church, than for fighting or looking after business.

So when the English had had enough of Danish kings—there were only three—and Edward was called back to be king, he was not at all fitted to take part in the stirring, anxious times in his fatherland, and caused much discontent by favouring the Normans he brought with him.

A very strong English nobleman, Earl Godwin, kept him for a time in some measure to his duty. Edward's greatest pleasure was in building churches, and the most beautiful of all his churches was that of the Abbey at Westminster, built after the pattern of those he knew and loved so well in Normandy, with rounded windows and arches. This abbey church at Westminster was entirely rebuilt by later kings.

It is said that Edward promised his cousin, William of Normandy, that he should be King of England at his death; in any case William determined that King of England he would be. The gentle, white-haired, rosy-faced king—the Confessor, as he was afterwards called—died in January, 1066. He was buried in his fine new church, finished only a few days before. Later, a beautiful tomb was raised over him, which we can see today in the heart of the Abbey.

The year 1066, which opened thus, was an important year for England, full of stirring history. The day after the weeping people had crowded the Abbey to see the funeral of Edward, they came back again to crown the successor whom they

had chosen—Harold, the son of Earl Godwin, whom they knew to be brave and wise, and a hater of the Normans.

And so, on that bright sunny day, in the keen north wind of January, the roof rang again with joyful shouts of " Yea ! " when the old archbishop asked if they would have Harold for king.

When William heard that Harold had become king after Edward, he was furious and at once set to work to get an army and a fleet together to invade England and secure the crown he longed for. He said Harold had promised him the kingdom as well as Edward ; but no one could really promise this, because it was the people's right to choose whom they would have as king.

THE BRIGHT SEPTEMBER DAY WHEN WILLIAM LANDED AT HASTINGS

When William landed at Pevensey, near Hastings, in bright September weather, Harold was at York. He marched his army down south by the great Roman road to London in nine days, and very quick that was, when so many had to go on foot. The battle of Hastings is one of the great battles of history. The Normans were led out by a singer on a fine prancing horse and the whole army caught up his song about the great hero of France and how he fought and won. The English did their best, but the Normans were too strong for them. Harold was killed, and the bravest of the best men of England fell fighting around him. This was on Saturday, October 14, 1066.

This battle, which had effects felt strongly through our history for over 350 years, and stronger still in our language till this day, has been pictured for us in tapestry scenes worked by Norman ladies who lived at the time.

The Bayeux Tapestry may still be seen in the ancient Norman town of Bayeux. It is worked with worsted on linen, like a sampler, in eight colours—by whom is not certain, though tradition says it was the Conqueror's wife who thus made history live with her busy fingers. Another tradition says it was William's half-brother Odo, Bishop of Bayeux, who, having fought in the battle, had the tapestry made to ornament his Cathedral at Bayeux. Probably this is true, for Odo and his men are prominently represented on the tapestry. A third tradition says the great sampler was worked by Adela, William the Conqueror's daughter.

Whoever made it worked it while the scenes were fresh in the recollection of thousands, and it has continued in existence for at least 850 years, though a part at the end, showing the flight of the English, has perished. The tapestry is 231 feet long and 20 inches wide, and it tells the story of William's adventurous conquest in 72 scenes. It is by far the oldest picture of English history.

THE LONELY CROWNING OF WILLIAM THE CONQUEROR

By December William had forced the people of the south to own him as king, and he was crowned in Westminster Abbey on Christmas Day. No shouts of welcome, no bright faces, and when the question was asked, " Do you take William of Normandy to be your king ? " there was but a sullen mutter ; they *had* to say Yes. William was almost alone on this great day.

Freedom for England was gone. The knights were killed, the poor were in utter misery. William gave much land and goods to his Norman followers, and, instead of paying rent in money, they had to promise to supply him with fighting men when he went to war. They made the men to whom they let land promise to do the same for them.

This feudal system, as it was called, lasted for many years in England. So that there should be no doubt how much land everyone had, and how many soldiers it was worth, William had a great book prepared, Domesday Book, in which is a description of all the great houses and estates in the kingdom. That book is still of great use.

THE WORK THAT THE CONQUEROR DID FOR ENGLAND

Another work of William's which lasts to this day was the making of the New Forest, in Hampshire. William made it to hunt in, and sorely distressed the poor folk who were turned out of their homes for his pleasure.

Some of the great castles William built to keep the English in order are still standing. Chief among them is the old part of the Tower of London, in which is a most perfect Norman chapel. It is said that from the gallery of this chapel William the Conqueror and his family looked down on the service below.

William spent a good deal of his time in Normandy, and at last died there. His sons behaved very badly to him, and he was alone in his death as he was at his

THE OLDEST PICTURE OF OUR HISTORY

We give in these pages the famous Bayeux Tapestry, made for William the Conqueror not long after his conquest, and so eight centuries old. The original, about 19 inches high and over 200 feet long, is said to have been embroidered on linen by the Conqueror's wife, but that is uncertain. It has 72 scenes, with 623 men and women, 762 animals, 41 ships and 37 buildings, the whole being here shown in the original colours.

Harold, sent to Normandy by King Edward the Confessor, rides to Bosham, on the Sussex coast.

Harold crosses the Channel in a fresh breeze, and makes for the lands of Count Guy of Ponthieu.

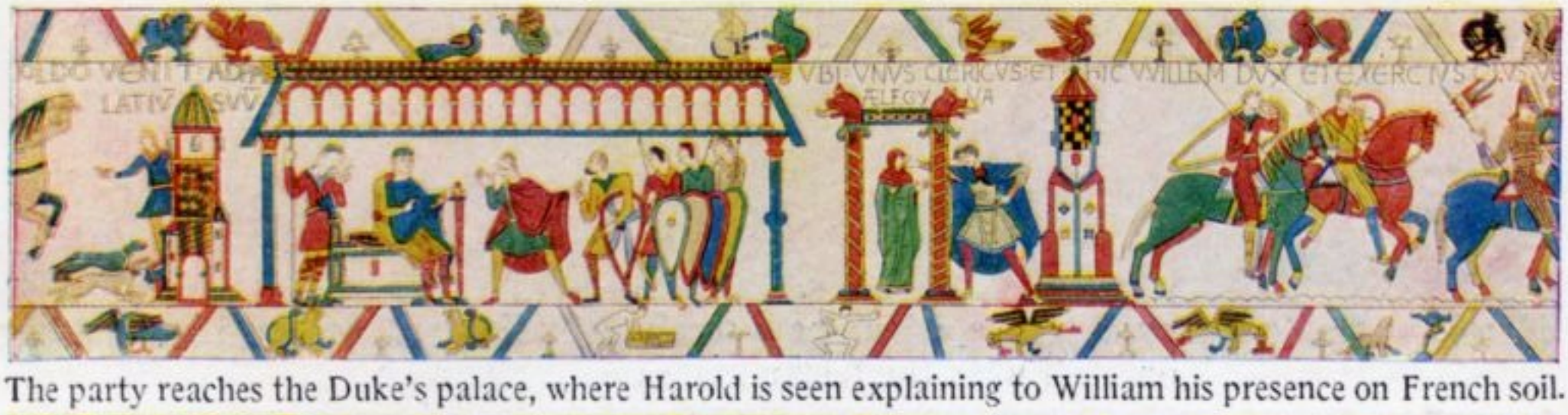
Adventure awaits Harold on French soil. As he lands from his vessel he is held a prisoner by Count Guy.

Harold is taken as a prisoner to Beaurain in Normandy, but treated honourably by his captor.

Messengers from William reach Guy. The little figure holding the horses may represent perspective.

A messenger bearing the Count's answer delivers his dispatch to Duke William at his court.

Harold is brought to Duke William. Guy rides ahead, and on approaching the Duke, points to his prisoner.



The party reaches the Duke's palace, where Harold is seen explaining to William his presence on French soil.

Harold marches with William to St. Michael's Mount, and rescues some of William's men at a river crossing.

The enemy is driven back to Rennes, but the final stand is made at Dinant, which is assaulted.

The town keys are surrendered. William rewards Harold by a gift of arms, and they march to Bayeux.

Here Harold takes a solemn oath to William on reliquaries, and returns home across the Channel

Harold comes to the royal palace, where he is received by Edward, crowned and holding his staff with the feeble hand of a dying man.

King Edward dies. and his body is borne with signs of mourning and in solemn state to its resting-place in old Westminster Abbey.

This picture of the death of Edward follows that of his burying. Harold accepts the offered crown and other emblems of royalty.

On the left is Archbishop Stigand. On the right is a comet—probably Halley's comet—at which the crowd is gazing in wonder.

The meaning of this incident is not clear. but it shows in detail an English ship making ready to land on French soil.

Duke William takes the decisive step. Sitting in council he gives orders for a large fleet to be built and equipped.

Here we see the building of the fleet, and men dragging the completed vessels to the water.

Next follows the loading of the fleet with supplies, including coats of mail, cross-bows, lances, and wine.

The invading fleet crossing the Channel to Pevensey. Note the large number of horses carried.

The Normans land on English soil. Note the horses coming ashore. Forage parties start out.

Bringing in captured supplies—sheep, cattle, and horses—by force of arms. The cooks at work.

A feast in progress; the meat is handed on spits William in council with Bishop Odo and Robert of Eu.

The camp at Hastings is finished: news of Harold arrives, and war begins with the burning of a house.

The Norman army marches out of camp eager to meet Harold and the sturdy defenders of English soil.

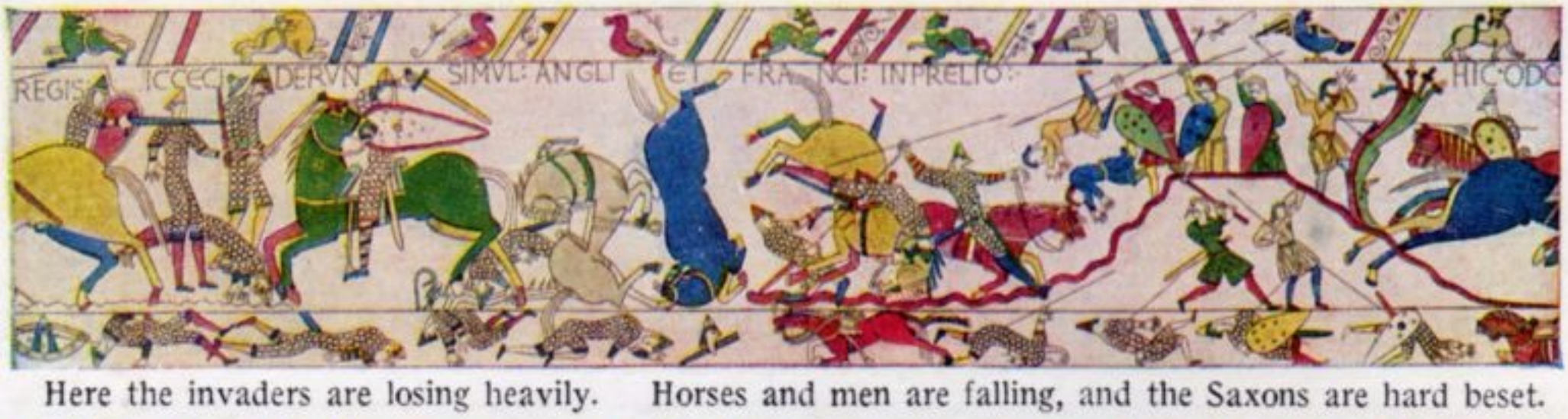
William (carrying a staff or mace) asks Vital for news of Harold's army. On the right are scouts at work.

A scout warns Harold of the approach of William's army. William addresses his men before the fight.

The Normans in battle array, inspired by their leader's words, advance against the foe.

The English are attacked on two sides and put up a stubborn fight against the charging horsemen.

The attack rages round Harold's bodyguard. Here we see the slaying of his brothers Lewine and Gyrd.



Here the invaders are losing heavily. Horses and men are falling, and the Saxons are hard beset.

Bishop Odo, holding a staff, heartens his men, and William lifts his visor to show that he has not fallen.

The last stand of the English takes place round Harold, who is seen pulling an arrow from his face.

Harold and his standard-bearer having been slain resistance ends, and the victors pursue the fugitives

This is an enlarged reproduction of part of one of the lower borders, representing farming operations

coronation, when all but a few priests rushed out to join in the tumult going on outside the Abbey.

When Taillefer the minstrel led the Normans to victory at Hastings, tossing and catching his long sword as he rode forward on his gay, prancing horse, the words of his bold song were in French. What a roar of deep bass voices as the whole army behind him took up the air!

When the voice of the archbishop rang out in Westminster Abbey two months later, on Christmas Day, asking if it were the will of the people that William should be their king, he spoke first in French.

A HISTORY OF THE CONQUEST BY A MAN WHO KNEW THE MEN OF HASTINGS

There is in the British Museum a history of the Norman Conquest, in French, written by a man who knew many of those who had fought in the battle of Hastings. For many years authors wrote in French, because the king and his court, and nearly all the richest people in England, spoke French. There is an old poem written in French for the children of those times, with English meanings below, just as in the French lessons in this book. The writer of long ago says that he has so arranged it in order that the children may understand what they are reading, and when to use *son et sa, mon et ma, le et la.* Even the accounts of what was done in the law courts, and at the meetings of the Wise Men who helped the king to govern the country, were all in French.

But the use of the language spoken by Bede and Alfred did not die out, as some thought it would, any more than did the English nation, sorely oppressed as it was. By slow degrees the English and their language rose again; Normans married English wives, and naturally their children and grandchildren spoke both French and English. By slow degrees the use of French as a separate language passed away, but the English which we speak now contains many words brought over by the Normans.

THE STORY OF THE NORMANS TOLD BY SIR WALTER SCOTT

If you read the fine story of Ivanhoe, by Sir Walter Scott, as everyone of us should read it, for it tells powerfully and with deep interest how the Normans and the English lived together more or less peacefully over a hundred years after the Conquest, you will find that English was enriched by being two languages welded together into one. There it is pointed out that the animals in the field, under the care of the English serving men, went by one name which was English, but when they were killed and placed on the table as food they took a French name. Thus the English cow in the pasture became changed into the French beef when it was cooked, and the English sheep appeared as French mutton; but now both these words have become equally good English.

Among other traces left by the Norman conquerors are the strong square towers, or *keeps*, to be seen not only by the banks of the Thames, but at Norwich and other places, especially at Rochester, where a magnificent tower still stands on the bank of the Medway as it stood in those Norman days. It is said that the Conqueror saw it. Most of these towers look strong enough now to stand a siege, and take us back to the days when the nobles shut themselves up in them, and sallied out to make prisoners and to steal and plunder. There was no redress for their unhappy neighbours.

THE CEASELESS COMING AND GOING ACROSS THE NARROW SEAWAY

All over England and the south of Scotland we find examples of the round arches and beautiful mouldings which go toward making what is called the Norman style. Some of the abbeys and cathedrals are still standing, having been repaired and added to through the centuries since the time of their founding; others are in ruins, without roofs, with grass and ivy showing up green against the grey stone. If we cross over to Normandy, we find many more of these buildings in the old home of the Normans; at Caen, where the Conqueror lies buried, and whence stone came in barges up the Thames to build old St. Paul's; at Bayeux, where the famous tapestry is kept; at Rouen, the old capital of Normandy, and scores of other places.

As we look out these places on the south side of the Channel let us think of the amount of coming and going there was across this arm of the sea, which lay in the midst of the dominions of the Dukes of Normandy who were also Kings of England. Barons and soldiers were constant travellers, for wars were unending then; traders, too, came and went; workmen and builders; fair ladies as brides, as well as the kings themselves,

who had often to cross from side to side to look after their possessions. The pictures of the ships of those days, so beautifully painted by the monks in monasteries, suggest small comfort on board, and very little room.

There was a man who fled over the Channel from Southampton in the first year of the twelfth century, and who must have felt in desperate anxiety for his ship to go quickly. He was a knight who had been hunting in the New Forest with the king, who was the Conqueror's son William. Either by accident or not, the arrow he shot killed the king, and the knight was so frightened he rushed away to Normandy. You can see the stone set up in the beautiful forest to mark the spot. But there was no mourning for the Red King, William Rufus; people were glad and thankful when they saw the last of his red hair. His brother, Henry the First, was king after him. He was nicknamed Beauclerc, the French for "fine scholar." He began well by giving his people, three days after his brother's death, a letter in which he promised to set right the bad rule of his brother's time, and to keep the laws of Edward and Alfred.

INTERESTING THINGS TO BE SEEN IN THE BRITISH MUSEUM

There are many of these letters (or charters) that we can see in the Manuscript Room of the British Museum, promises of all kinds about lands and government, made through many years of history. The earliest belong to Saxon times, and we can find on them many names that we already know, such as Edgar, who rowed on the Dee; Canute the Dane who rebuked the flattering courtiers when they asked him to command the waves of the sea to stop; and Edward the Confessor, who built old Westminster Abbey.

Henry had pleased the English very much by marrying a princess of Scotland, belonging to the old Royal Family of Alfred and Edgar. They felt now that they had some share in their country, and took heart once more. Queen Maud was a good woman, and she helped her husband in many ways. He put down the oppressive power of the nobles and destroyed many of their castles. He also helped the poor to get justice. Henry lost his only son when the boy was eighteen. He was drowned while crossing the Channel.

The fine new White Ship, in which Henry had been persuaded to let his son travel, struck on a rock, and only one of all the passengers managed to hold on to the wreck till morning. The king never recovered from the great shock.

Though the nobles promised to take his daughter Matilda for their queen at his death, it was Henry's nephew Stephen who succeeded him.

THE WAILING OF THE PEOPLE WHEN THE LAND BARE NO CORN

In Henry's reign the Anglo-Saxon Chronicle begun by Alfred came to an end. Matilda and Stephen disputed long for the crown. One old chronicle gives an account of Matilda escaping from Oxford with her companions over the Christmas snow all dressed in white, so as not to be seen. Fighting went on, and the barons began building castles again and taking people's property from them and doing as they liked till all the good Henry had tried to do in securing peace and quiet and justice was undone. "The land bare no corn," wails the historian. "You might as well try to till the sea as the land for the wickedness that is done in it."

When Stephen died Matilda's son became King Henry the Second. His wife Eleanor was a French princess, heiress of three splendid provinces in France, while Henry was Duke of Normandy and overlord of Brittany, so that his dominions reached from the north of England to the Pyrenees, the great mountain range which separates France and Spain.

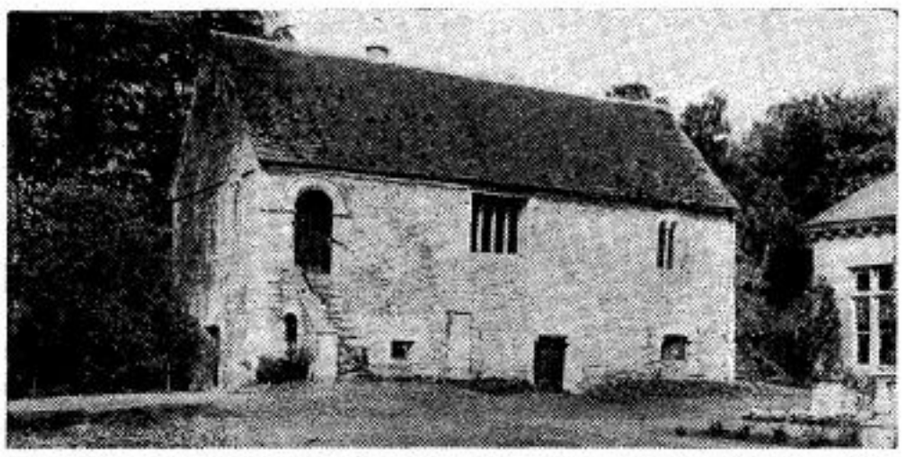
Much as he had, he was always going to war and planning to get more; especially he wanted to be king over the whole of the British Isles. After restoring order in England, by destroying castles and re-establishing the power of the courts of justice, he made the Scottish king give up Northumberland, Cumberland and Westmorland, all south of the Cheviot Hills.

THE WILD WAYS AND THE WILD CHIEFS OF THE IRISH

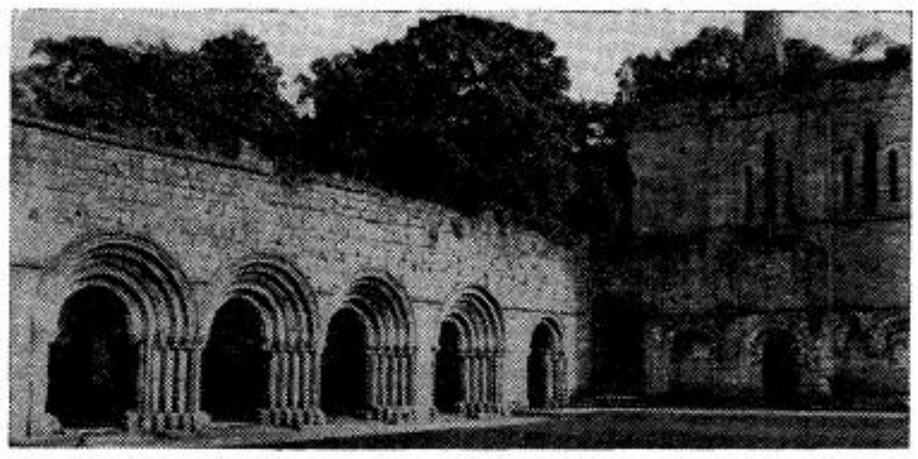
He tried to get Wales and Ireland, without success; but the only Englishman who was ever Pope of Rome lived at this time, and made Henry a present of Ireland, because it was said then that all islands belonged to the Pope, and that he could do what he liked with them.

Naturally, the Irish did not agree to this. They preferred their own wild ways, with wild chiefs always struggling and fighting together; and though Henry succeeded in getting some sort of order in the part of

THE WORK THE NORMANS LEFT BEHIND

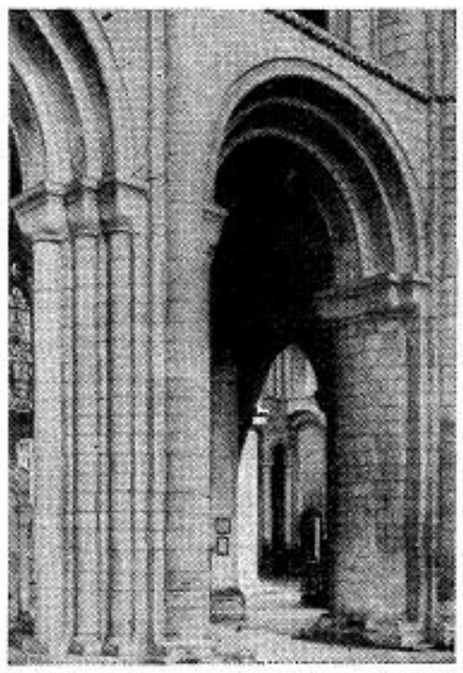


The Manor House at Boothby Pagnell in Lincolnshire

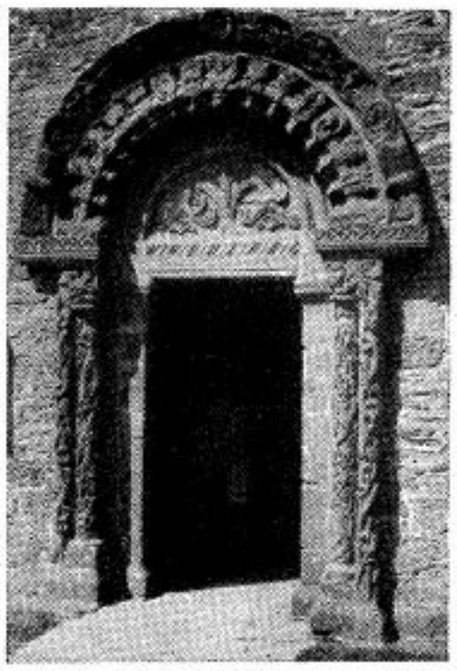


The beautiful cloister court of Fountains Abbey in Yorkshire

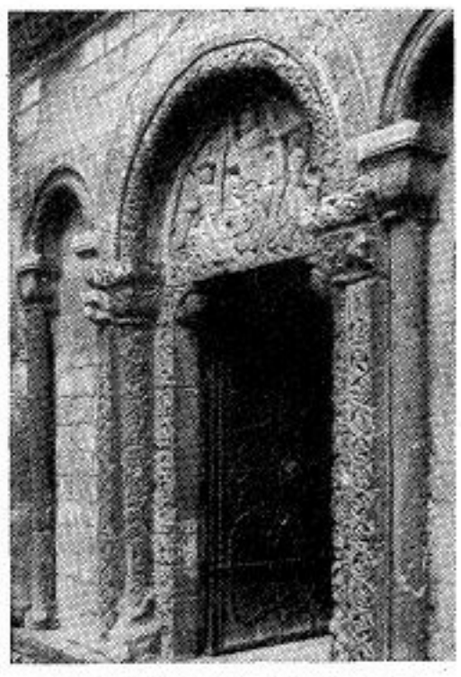
Patrixbourne doorway in Kent



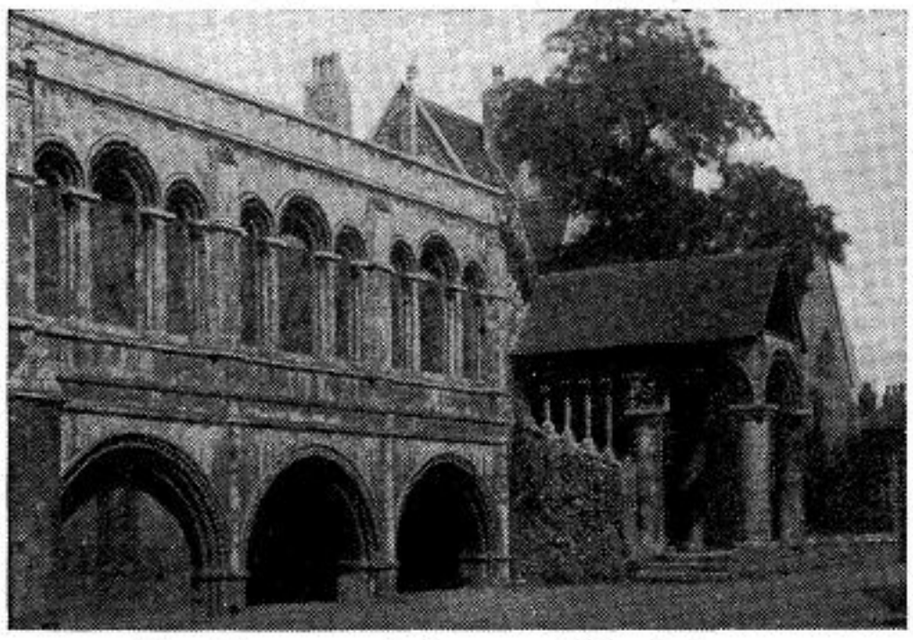
The north transept of Ely Cathedral



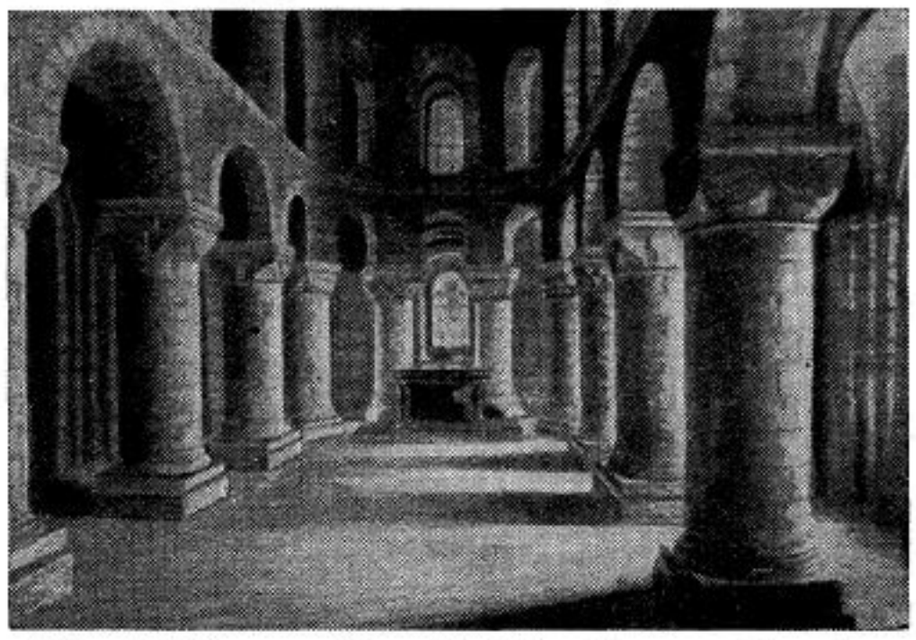
The gate at Kilpeck in Herefordshire



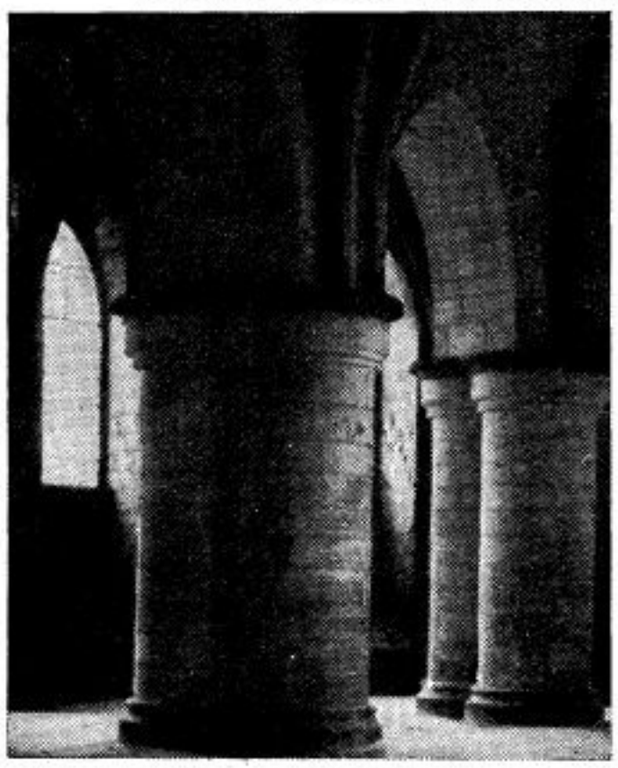
The Prior's doorway, Ely Cathedral



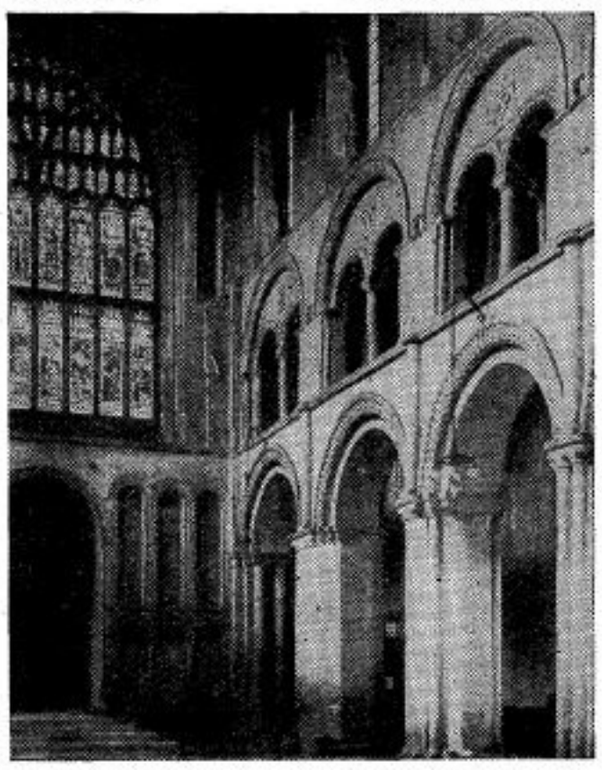
The Norman staircase at Canterbury



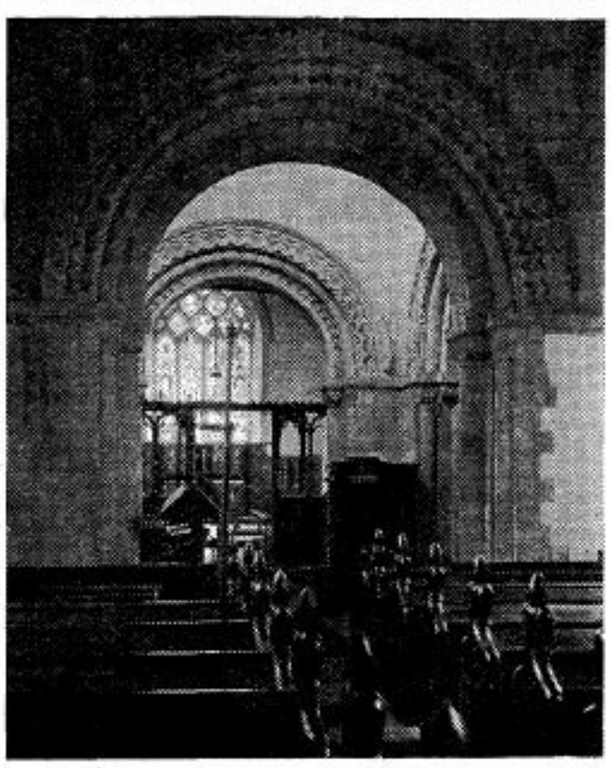
The old Norman Chapel at the Tower of London



The massive columns of Canterbury



The lofty nave of Rochester Cathedral



The magnificent interior of Old Shoreham Church in Sussex

Ireland that was nearest to England, things were as bad again, or worse, as soon as he was gone. A French king said of him with amazement: "The King of England is now in Ireland, now in England, now in Normandy. He may be rather said to fly than to go by horse or boat!"

If we go to Canterbury Cathedral we see the spot where the great archbishop of the time of Henry the Second met his death. His name was Thomas à Becket. He had quarrelled with the king about some Church affairs, chiefly about how the clergy were to be punished when they did wrong. It is said that the trouble began partly in the walls of the castle of Eynsford, which still stand in the shadow of the Editor's Kent hilltop.

THE FOUR MEN WHO CAME FROM NORMANDY TO KILL A MAN

Henry, in a passion one day, said he wished someone would rid him of the troublesome archbishop. So four men hastened over from Normandy, where King Henry then was, and, taking the king at his word, killed Becket in his cathedral. The steps that lead to the spot where the archbishop was buried are worn by the knees of pilgrims who for long years went to pray at the tomb of the man who had suffered for boldly defending the clergy against the king.

Henry was not forgiven till he had walked barefooted and bareheaded to the chapel, and received a beating with rods from each of the monks in turn. Before he died he portioned out his great dominions to his sons; but they did not like his keeping the overlordship in his own hands, and there were miserable family quarrels in consequence. When the name of his favourite son John was found on the list of those fighting against him, the old man could bear no more. Turning his face to the wall, he said bitterly, "Let things now go as they will. I care no more for myself or for the world."

RICHARD THE CRUSADER, AND HOW HE GOT HIS MONEY FOR HIS WARS

His son Richard the First then became king. If we look at the statue of him set up in front of the House of Lords at Westminster we see him as a fine figure on a strong horse, clothed in armour made of little rings of metal, and holding aloft the long sword he used against enemies far away from England. During the ten years of his reign he was nearly always away fighting.

The great barons took advantage of Richard's absence to break out again, and the people suffered much from bad trade and bad cultivation of the fields, and from having nearly all the money they had squeezed out of them.

Of all things, Richard loved fighting and adventure best, and in his time the most exciting adventures were to be had in the Holy Land, at the eastern end of the Mediterranean Sea. The country and its capital, the scene of our Lord's life on Earth, had fallen into the hands of men who did not believe in Him, and who treated very badly the Christians who went to pray at the spots that were so sacred to them. So the Christians of Europe got up expeditions, hoping to win back the Holy Land.

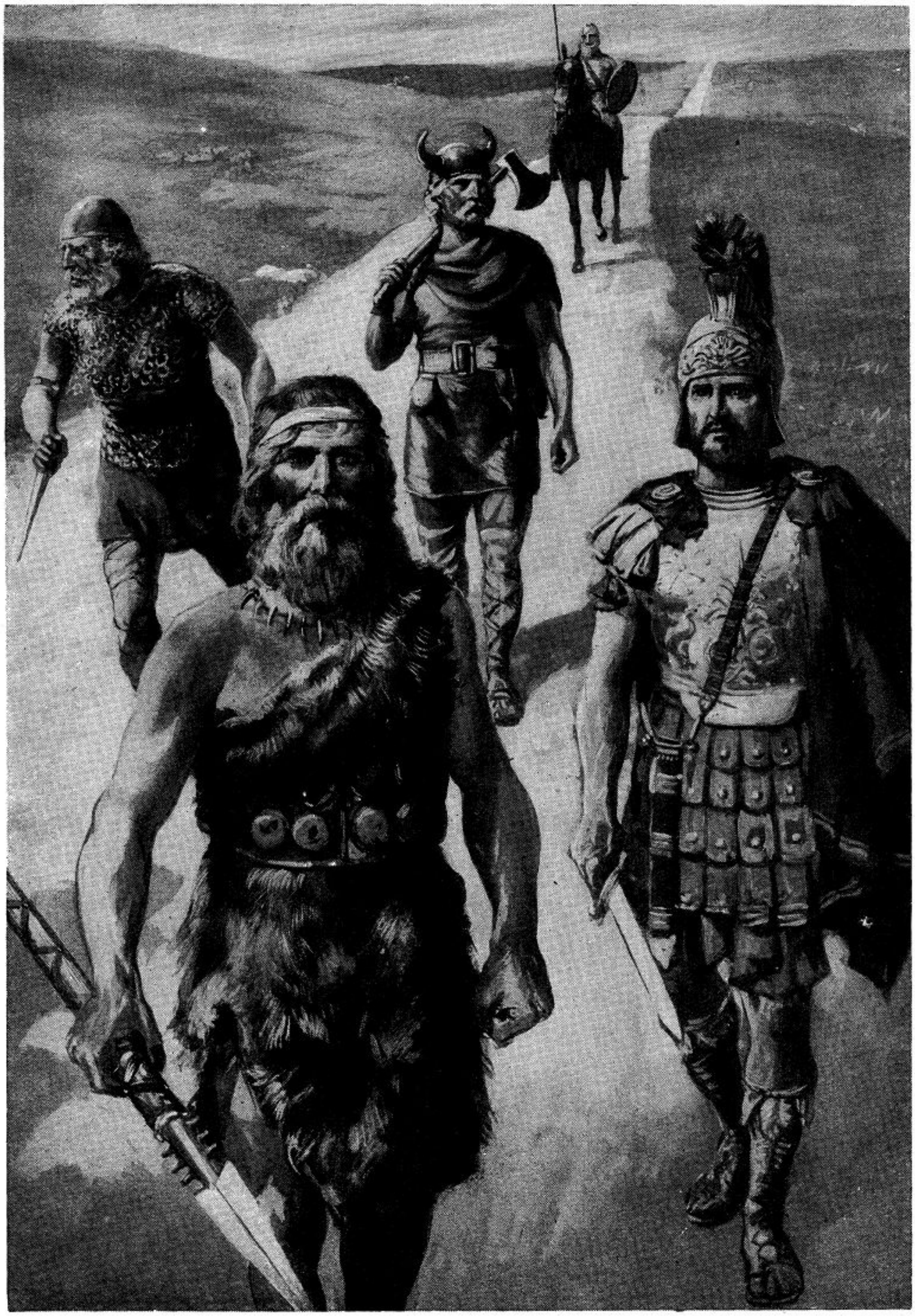
Anyone can see to this day in London a sight that carries the mind back to those chivalrous and stirring times. An Order of Knights was formed to patrol and guard the way by which pilgrims travelled from the sea coast of Palestine to the site of the Temple at Jerusalem, and the members of the Order were called Knights Templars. They belonged to all Christian lands, and one of their greatest and richest centres, or homes, was in London.

RICHARD FORGIVES HIS ENEMY ON HIS DEATH-BED

If from the Strand you enter the Temple through an arched doorway you will find the Templars' ancient church still used for worship, and just within it the prostrate effigies of knights whose crossed legs are a sign that they actually served as guardians of the Pilgrims' Way in the Holy Land.

Richard joined the third of these expeditions, and he needed a great deal of money for the journey. He even sold a treaty which had been gained by his father from the Scottish king, in which he, Henry, was acknowledged as overlord for the whole of Scotland. But Richard did not care; once the fever and excitement of the Crusades were on men, they seized what money and arms they could lay hands on, sewed strips of cloth like a cross on their arm, and hurried off by sea and by land to gain renown in fighting the enemies of Christ.

Round the base of Richard's statue in Westminster are shown the scenes of his death at the siege of a castle in France. On one side is the terrible fight going on; on the other the king lies on his bed, pardoning the man whose arrow caused the wound from which he is dying.



THE MEN OF THE AGES—BRITON, ROMAN, SAXON, DANE, AND NORMAN, PASS DOWN THE ROAD OF TIME THROUGH ENGLISH HISTORY

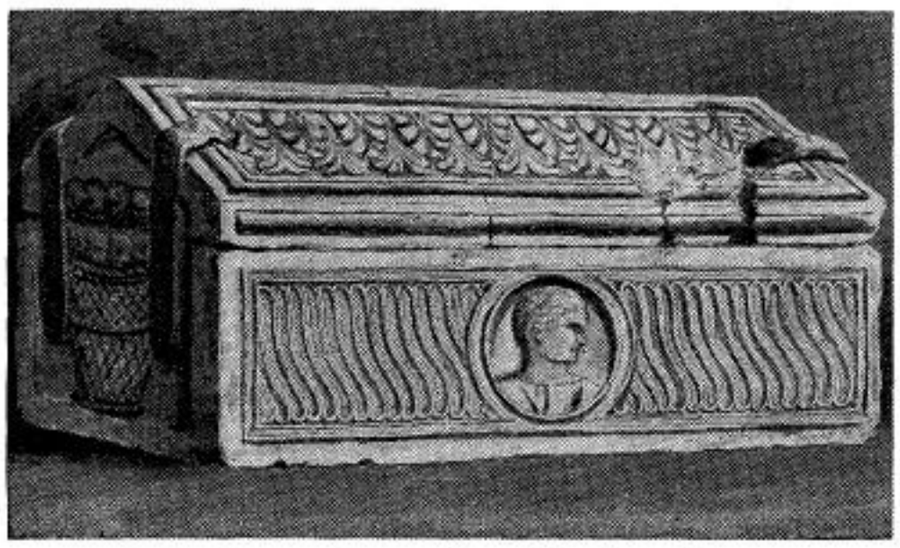
An Old Stone Figure

Bronze Jug found in Kent

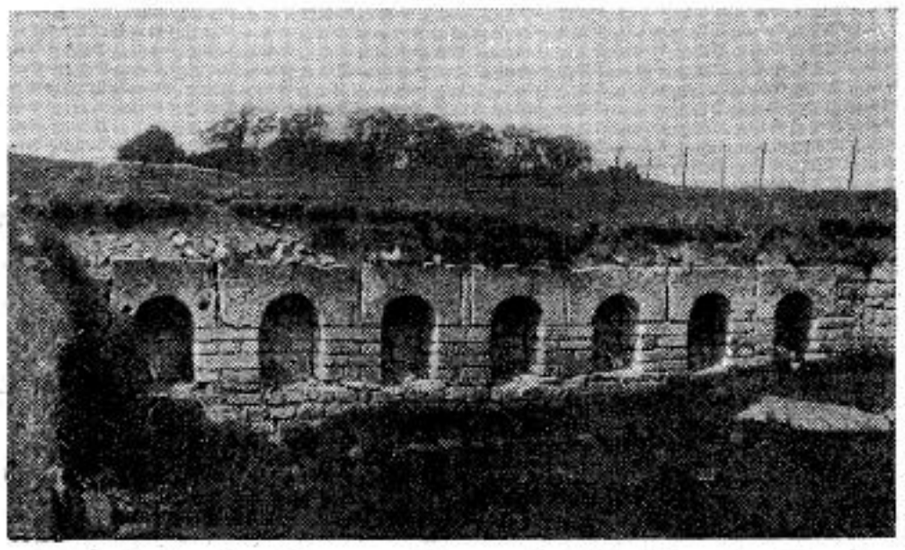
A Gateway in the Roman Wall

A Stone Figure of a Lady

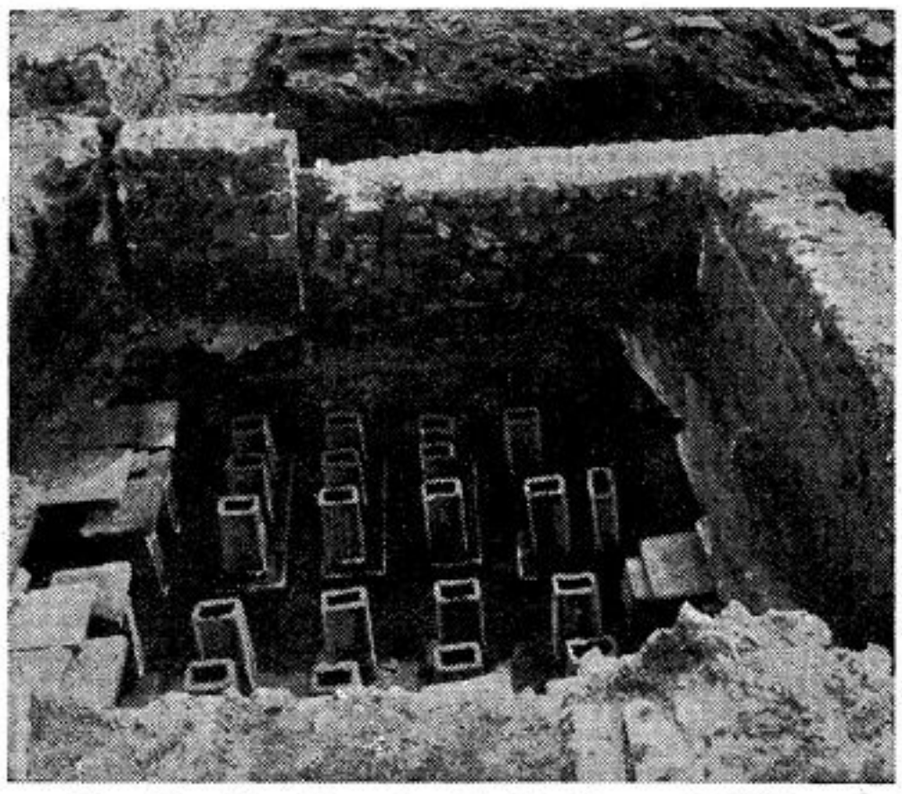
A Tessellated Pavement from London



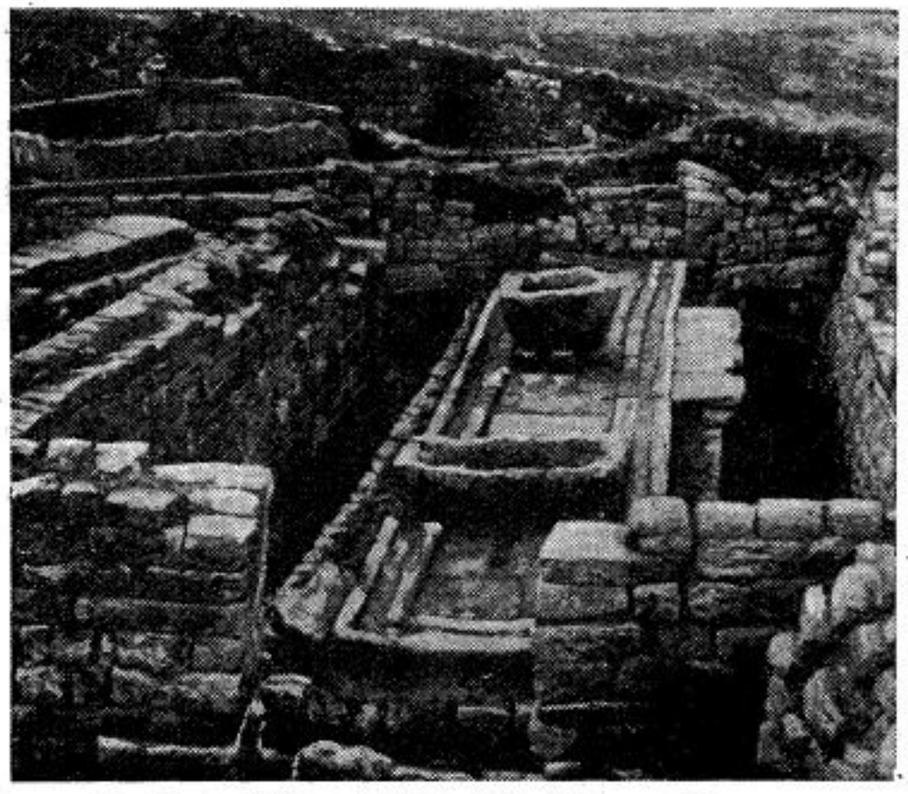
Sarcophagus found in London



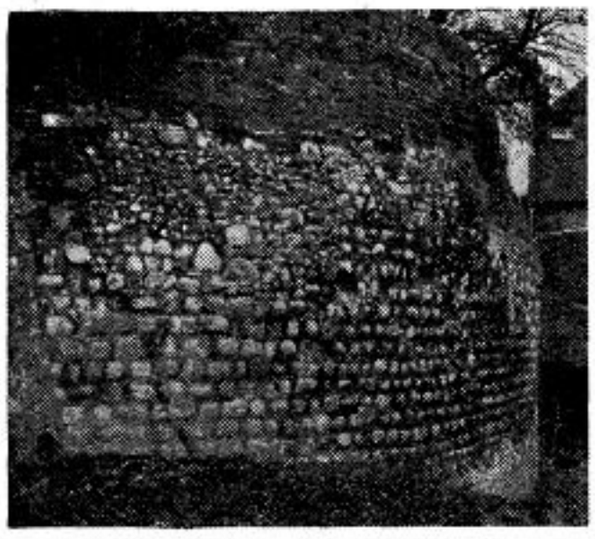
Arches of a Roman House in Northumberland



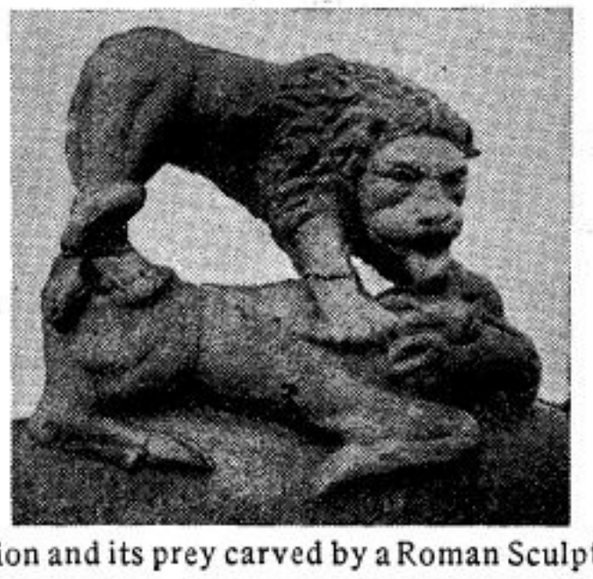
The Heating Chamber in the Darenth Villa



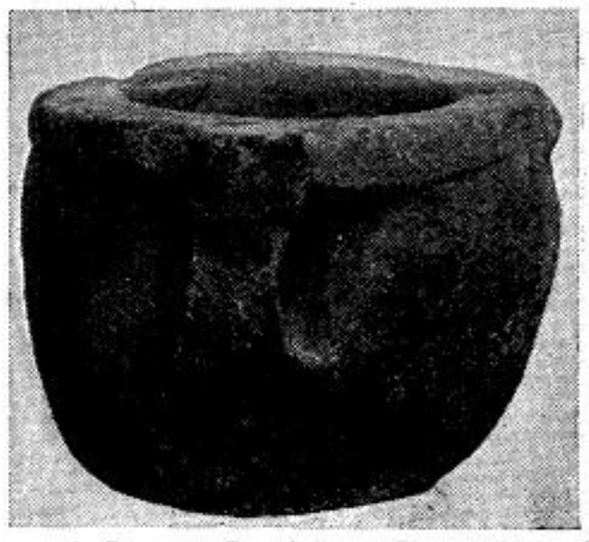
Foundations of an Old Roman House



The Roman Wall at Rochester



A Lion and its prey carved by a Roman Sculptor



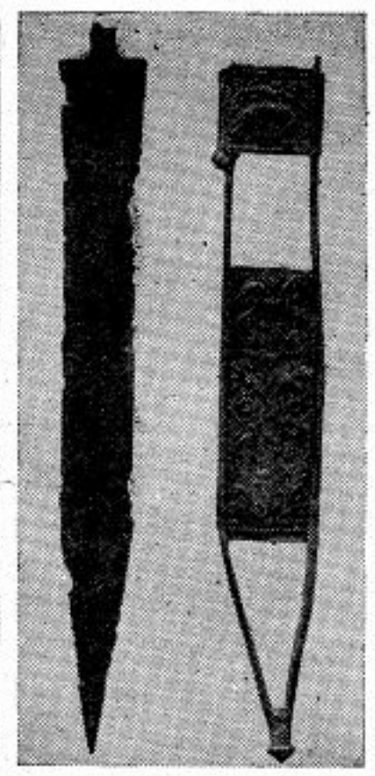
A Roman Bowl from Darenth

A FEW VISIBLE FRAGMENTS OF ROMAN BRITAIN

Small Statue found in Lincolnshire

A Sculpture found near Bishopsgate

An Altar, with Inscriptions

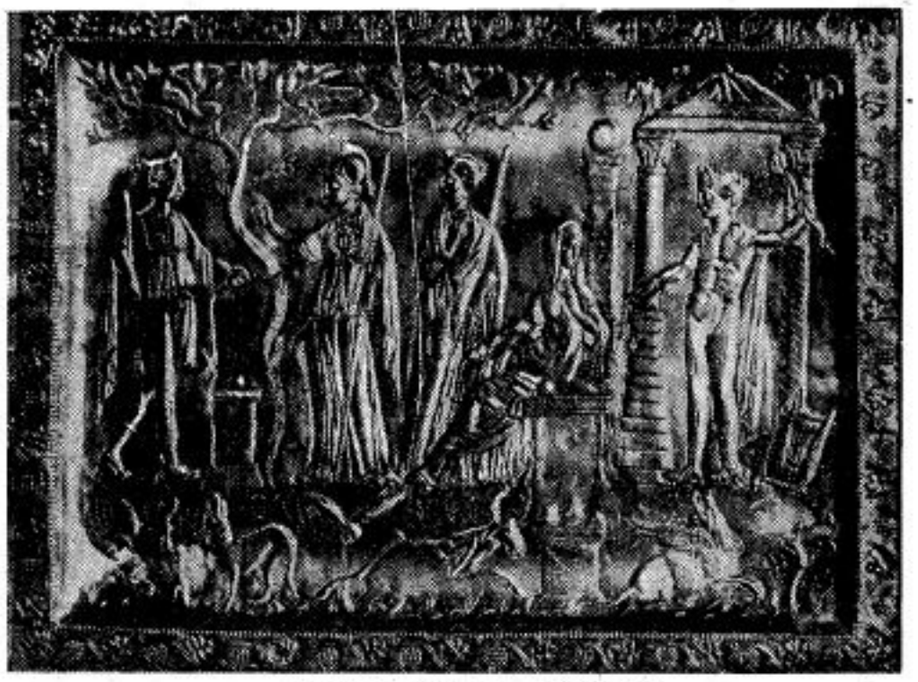


Iron Sword and its Bronze-plated Scabbard

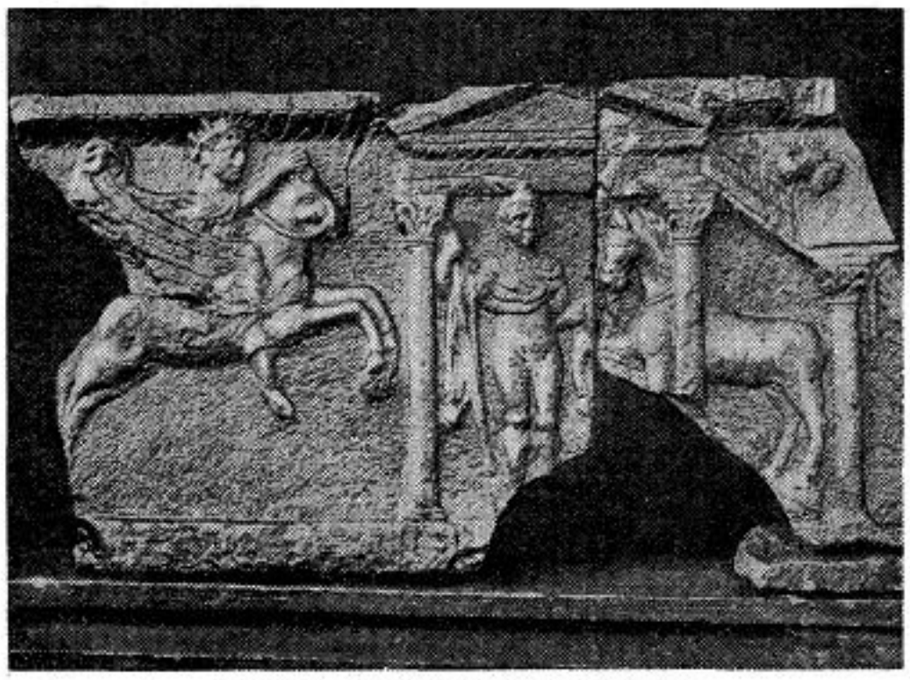
Statue found in Suffolk

The Roman Wall across Britain

Roman Villa under a field at Darenth, in Kent



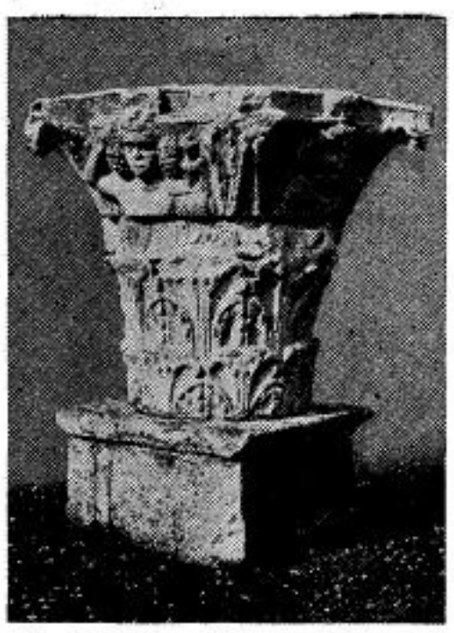
A Rare Bronze Tablet



A Stone Tablet with Figures

A Roman Spearman

A Beautiful Vase

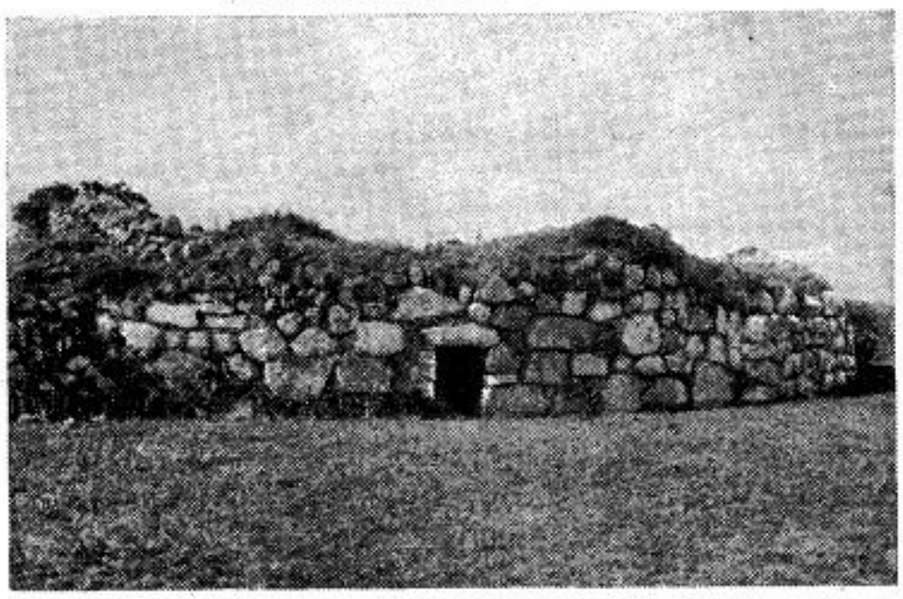


Capital of a Roman Column

Figure of a Warrior

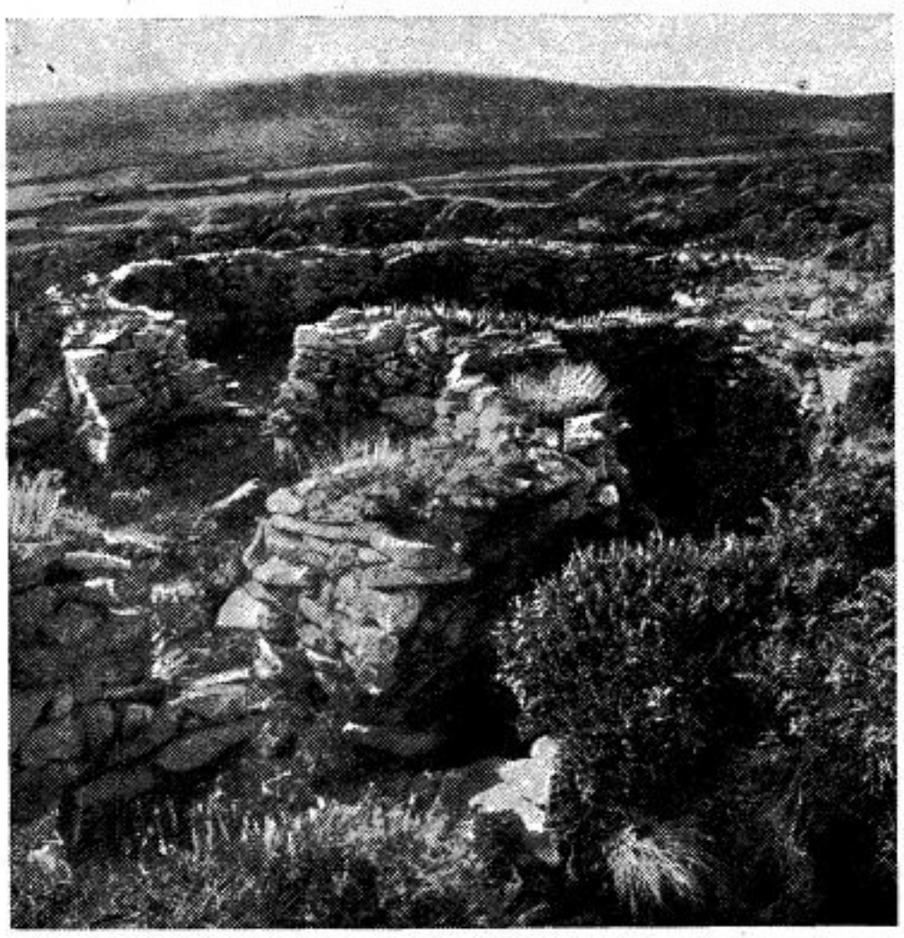
WHAT THE ROMANS LEFT BEHIND THEM

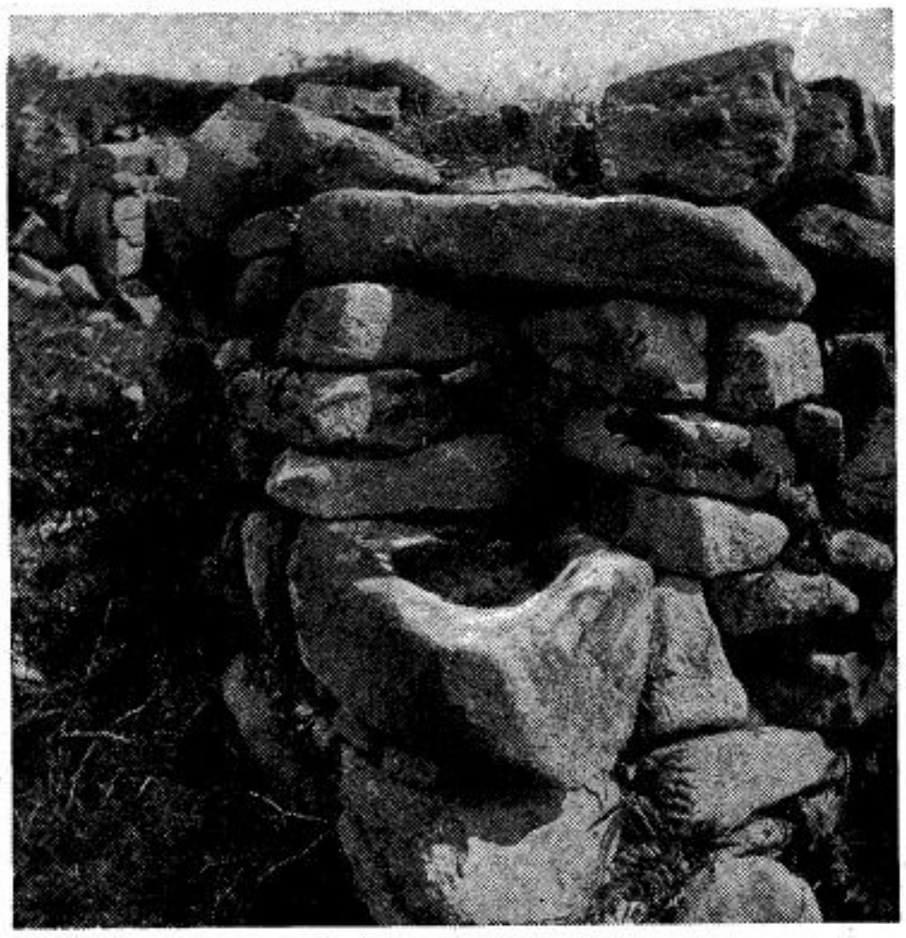
Stonehenge, one of the oldest monuments in Britain, probably a Druid temple



A British house in the Bronze Age

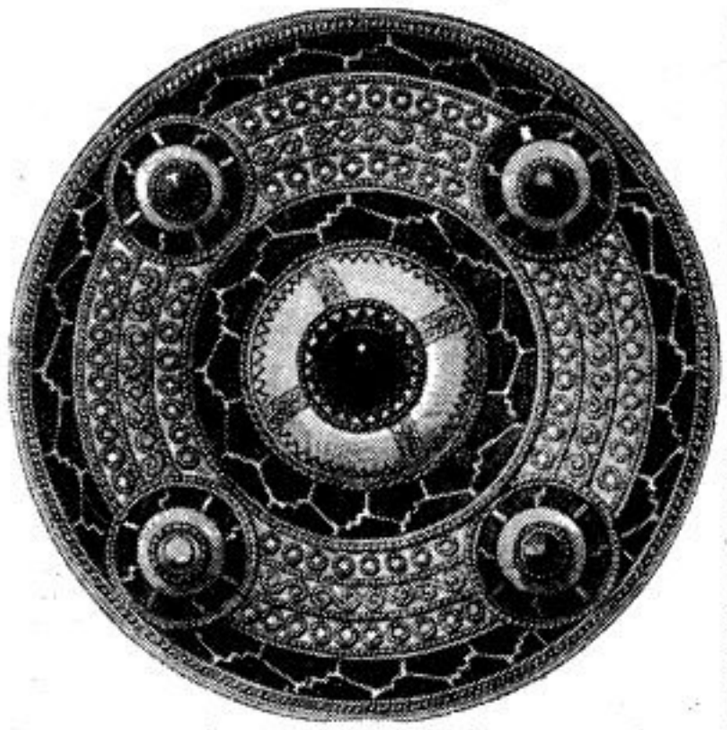
Doorway of an ancient British house





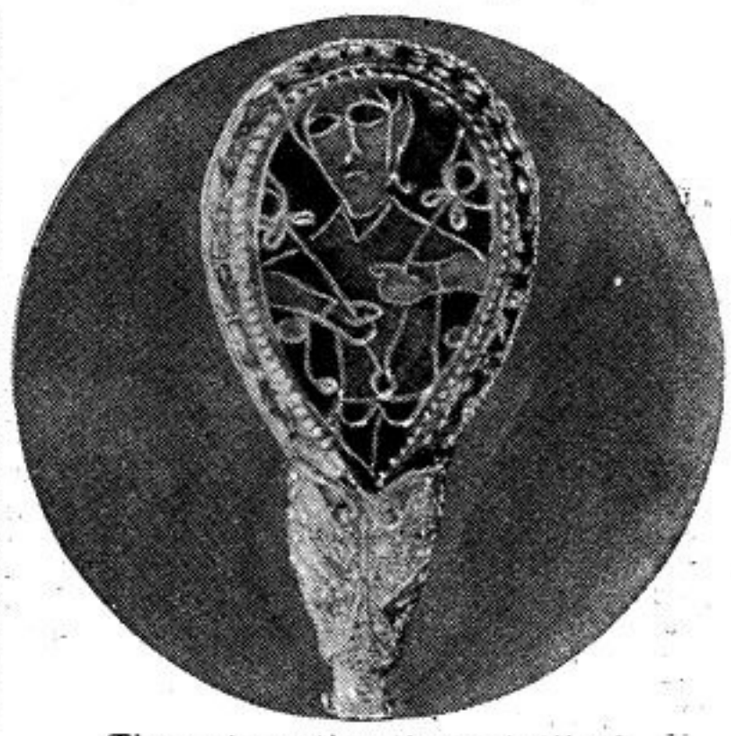
An old British village and the stone there for grinding corn

A stone circle of the Bronze Age—probably the scene of great gatherings



A Beautiful Brooch found at Sarre in Kent

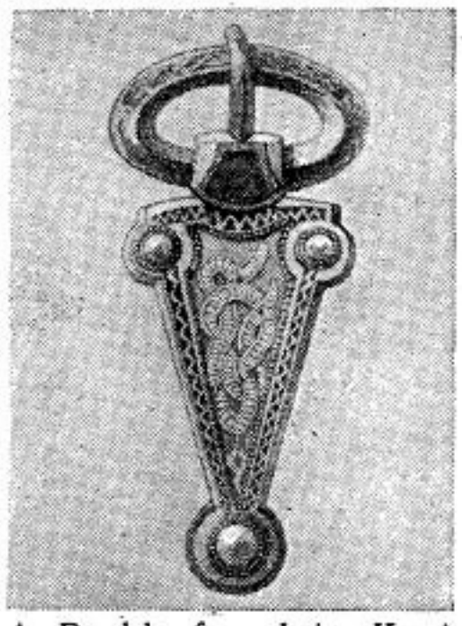
A Saxon Cross at Hexham



The only authentic portrait of King Alfred

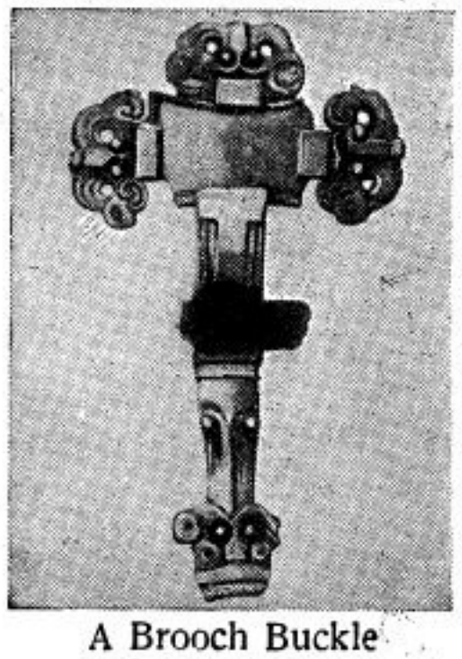
St. Martin's Cross and Ruins on Iona Island

The Fine Old Saxon Church at Bradford-on-Avon

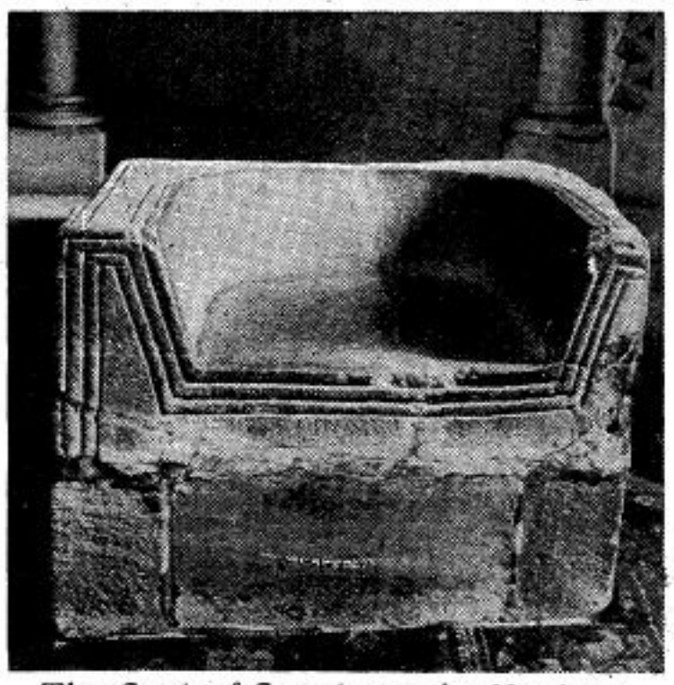


A Buckle found in Kent

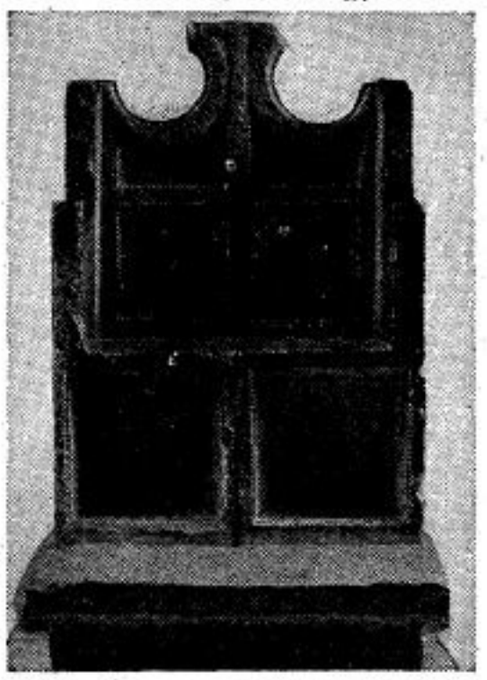
Anglo-Saxon Pendants, a Ring, and a Necklace



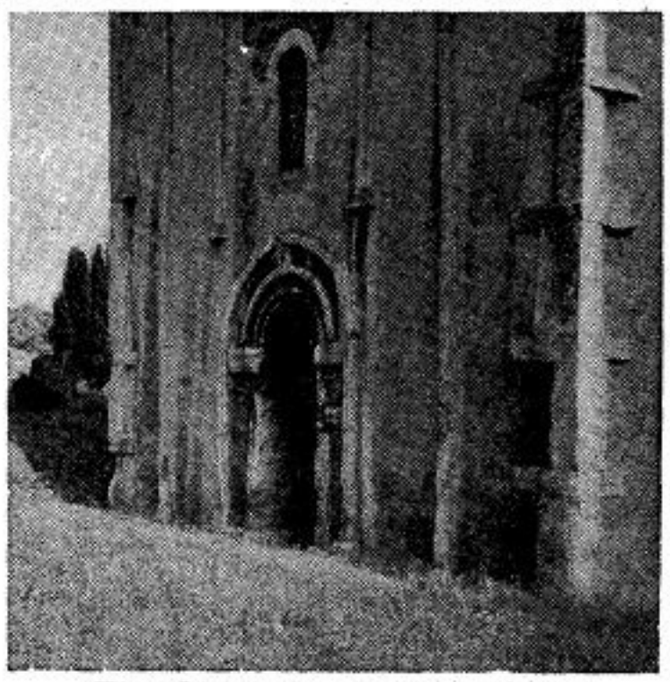
A Brooch Buckle



The Seat of Sanctuary in Hexham Abbey



St. Augustine's Chair in Canterbury Cathedral



The Old Saxon Tower of the church at Earls Barton

SOME OF THE THINGS THE SAXONS LEFT BEHIND

THE INTERESTING NATURAL FEATURES OF THE BRITISH ISLES

Sea here is more than half a mile deep

Fissure volcanoes, like those of Iceland, vents in the earth from which lava welled up, were once common in the Hebrides

Counting small islets the British Islands number about 5000

The sea here is nearly a mile deep

Fingal's Cave

The Giant's Causeway

Fingal's Cave, Staffa, and the Giant's Causeway, Antrim, were caused by lava shrinking as it cooled and splitting up into columns as drying starch splits

In some parts of Donegal the layers of rock have been bent up and folded over themselves

Scotland has 2500 miles of coast line, or one mile to every 12 square miles of area

HEBRIDES

Prevailing winds in this direction

STAFFA

FINGALS CAVE

This coast is slowly rising out of the sea

GIANT'S CAUSEWAY

Lough Neagh, 150 square miles, the biggest lake in the British Isles

ORKNEY ISLANDS

This coast is slowly rising out of the sea

The northern area of Scotland is largely moor and forest in which red deer are preserved

FOCHABERS

Here, at Fochabers, are earth pillars that have been washed by rain out of a mass of conglomerate that once filled the valley

Loch Lomond, 45 square miles, is the largest lake in Great Britain

ARRAN

GLASGOW

At Partick Park, Glasgow, the remains of a coal measure forest can be seen with its tree trunks above ground

Arran was once a great glacier bed

The lake district was once a great volcanic area

The north of Shetland is as near to Norway as to the mainland of Scotland

SHETLAND ISLANDS

The soil of the Orkneys is very shallow and only about a half of the area is cultivated

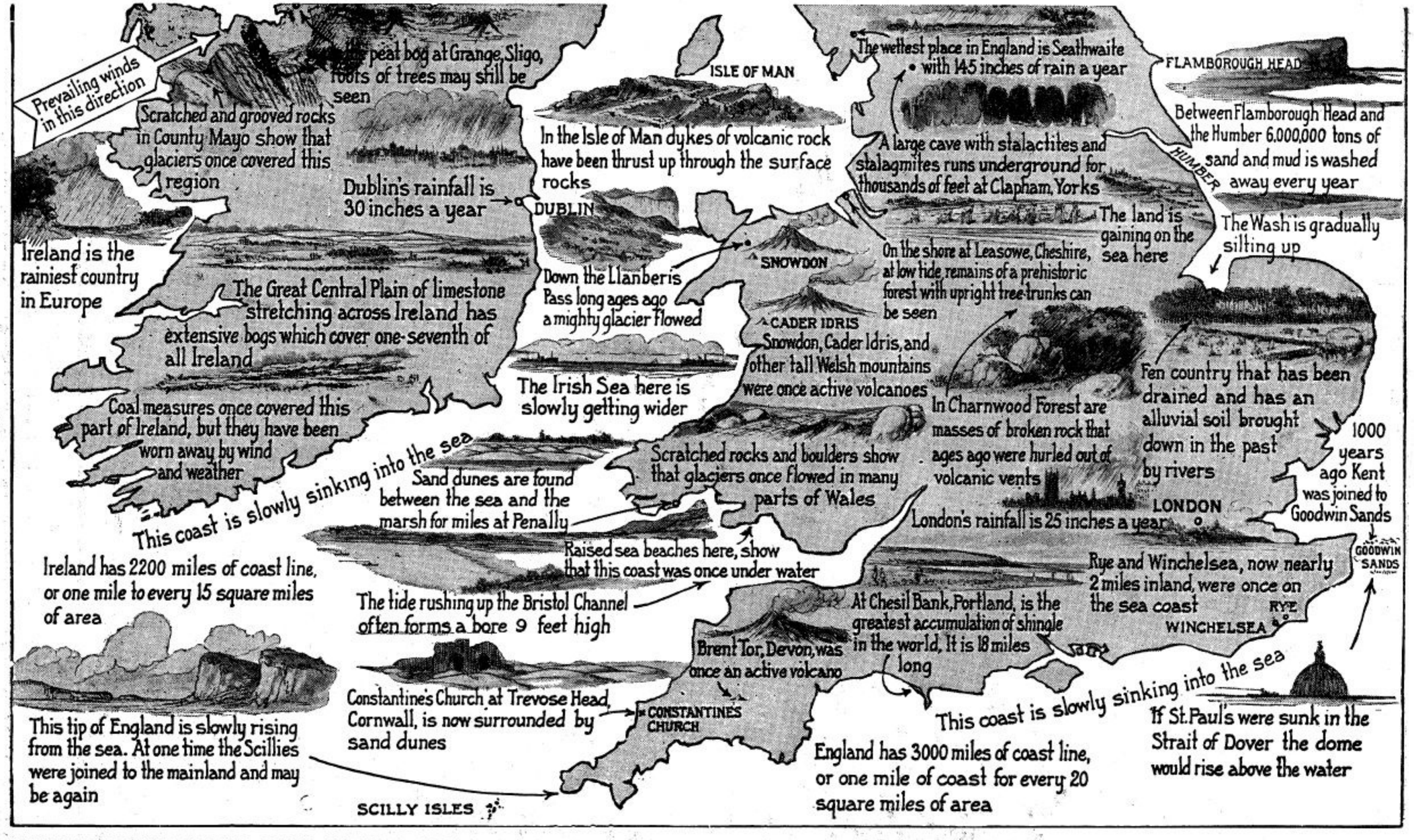
ORKNEY ISLANDS

The isolated Bass Rock is the plug or neck of an ancient volcano

Active volcanoes once existed at Berwick

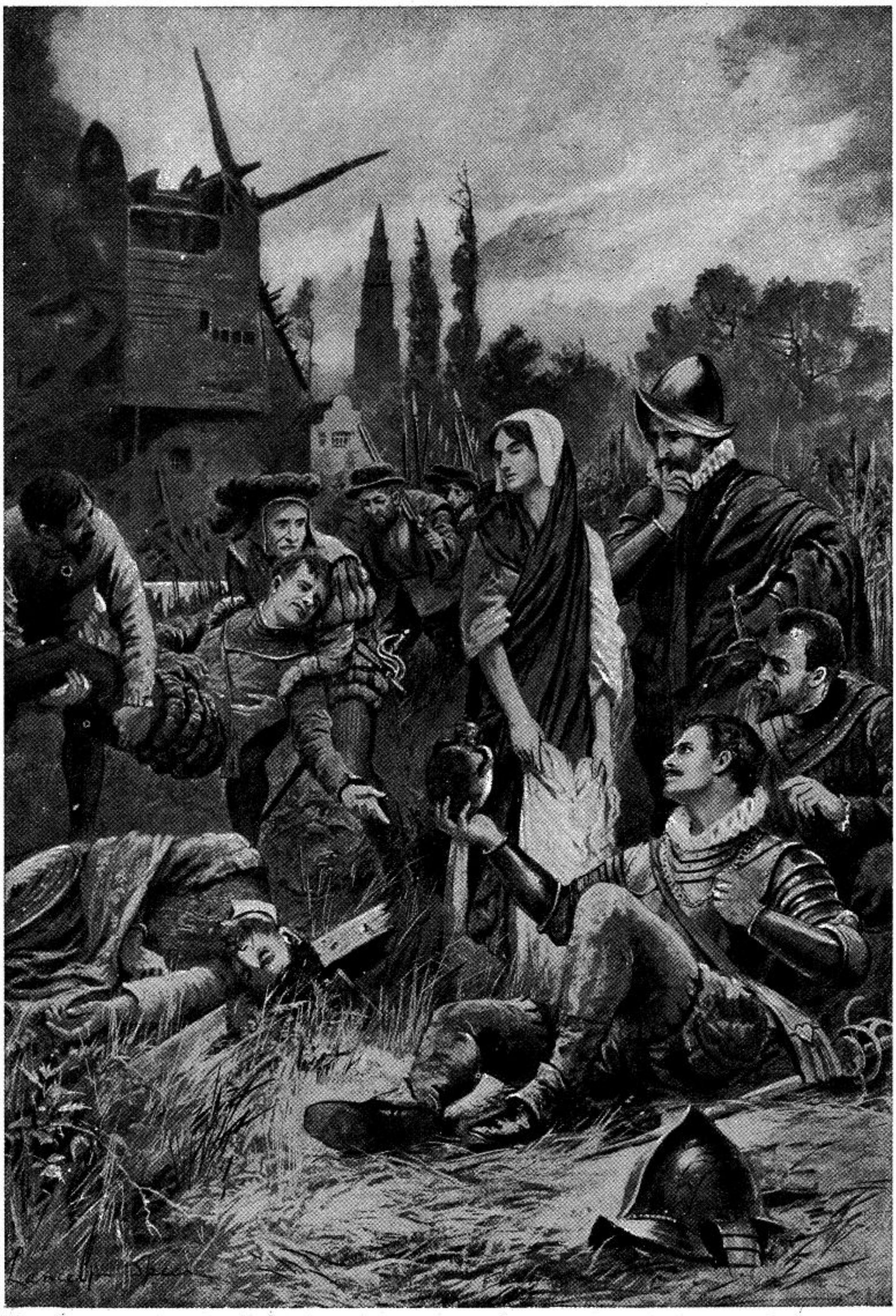
The sea here is 300 feet deep

In Yorkshire are many swallow holes, funnel shaped chasms in the limestone into which streams disappear

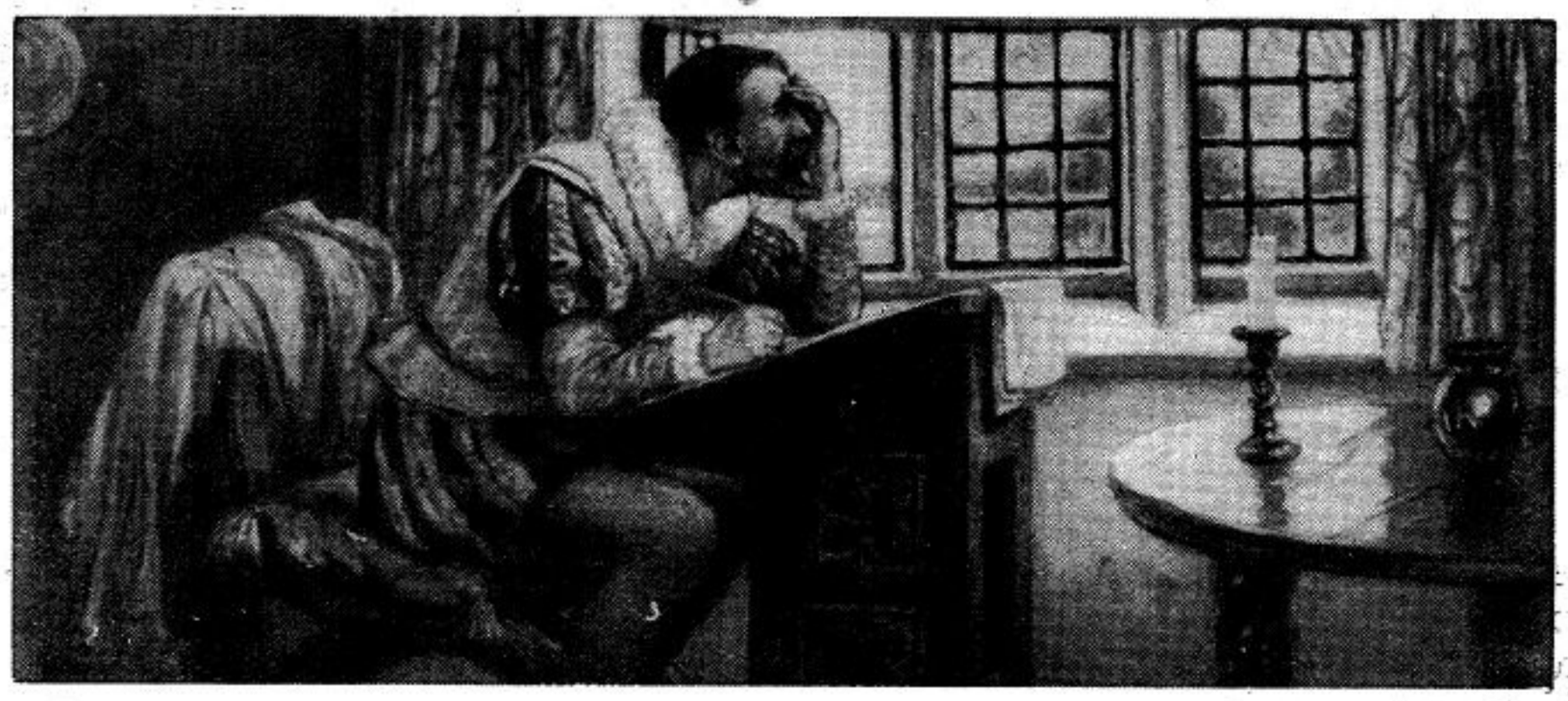

Prevailing winds in this direction
Ireland is the rainiest country in Europe
Scratched and grooved rocks in County Mayo show that glaciers once covered this region
peat bog at Grange, Sligo, roots of trees may still be seen
Dublin's rainfall is 30 inches a year
DUBLIN
The Great Central Plain of limestone stretching across Ireland has extensive bogs which cover one-seventh of all Ireland
Coal measures once covered this part of Ireland, but they have been worn away by wind and weather
ISLE OF MAN
In the Isle of Man dykes of volcanic rock have been thrust up through the surface rocks
Down the Llanberis Pass long ages ago a mighty glacier flowed
The Irish Sea here is slowly getting wider
SNOWDON
CADER IDRIS
Snowdon, Cader Idris, and other tall Welsh mountains were once active volcanoes
The wettest place in England is Seathwaite with 145 inches of rain a year
A large cave with stalactites and stalagmites runs underground for thousands of feet at Clapham, Yorks
On the shore at Leasowe, Cheshire, at low tide, remains of a prehistoric forest with upright tree-trunks can be seen
The land is gaining on the sea here
FLAMBOROUGH HEAD
Between Flamborough Head and the Humber 6,000,000 tons of sand and mud is washed away every year
HUMBER
The Wash is gradually silting up
Fen country that has been drained and has an alluvial soil brought down in the past by rivers
In Charnwood Forest are masses of broken rock that ages ago were hurled out of volcanic vents
LONDON
London's rainfall is 25 inches a year
1000 years ago Kent was joined to Goodwin Sands
GOODWIN SANDS
Scratched rocks and boulders show that glaciers once flowed in many parts of Wales
This coast is slowly sinking into the sea
Sand dunes are found between the sea and the marsh for miles at Penally
Raised sea beaches here, show that this coast was once under water
The tide rushing up the Bristol Channel often forms a bore 9 feet high
Ireland has 2200 miles of coast line, or one mile to every 15 square miles of area
This tip of England is slowly rising from the sea. At one time the Scillies were joined to the mainland and may be again
SCILLY ISLES
Constantine's Church at Trevose Head, Cornwall, is now surrounded by sand dunes
CONSTANTINES CHURCH
Brent Tor, Devon, was once an active volcano
At Chesil Bank, Portland, is the greatest accumulation of shingle in the world. It is 18 miles long
Rye and Winchelsea, now nearly 2 miles inland, were once on the sea coast
RYE
WINCHELSEA
This coast is slowly sinking into the sea
England has 3000 miles of coast line, or one mile of coast for every 20 square miles of area
If St. Paul's were sunk in the Strait of Dover the dome would rise above the water

THIS PICTURE-MAP SHOWS MANY NATURAL FEATURES THAT TELL OF THE PAST HISTORY OF THE BRITISH ISLES AND OF CHANGES NOW GOING ON

THE LAST HEROISM OF SIR PHILIP SIDNEY



Sir Philip Sidney, lying on the battlefield at Zutphen in a raging fever, called for a cup of water, and was about to place it to his lips when his eye caught the gaze of a wounded comrade dying of thirst. Sir Philip stretched out his arm and gave the water to the dying man, saying: "Soldier, thy need is greater than mine."



ON SIR PHILIP SIDNEY

Sir Philip Sidney, who was born in 1554 and died in 1586 from the result of a wound received while fighting in the Netherlands, was one of the most beautiful characters of his time. Although we know him as one of the finest poets of the Elizabethan period, none of his poems was printed during his lifetime, and the fame which he enjoyed in his own day was largely due to his personal character. Whenever we wish to think of a true hero and a Christian gentleman Sir Philip Sidney's name comes to mind. This poem was written by Sir Fulke Greville, who also wrote his life.

SILENCE augmenteth grief, writing increaseth rage,
Staled are my thoughts, which loved and lost the wonder of our age ;
Yet quickened now with fire, though dead with frost ere now,
Enraged I write I know not what ; dead quick, I know not how.

HARD-HEARTED minds relent, and Rigour's tears abound,
And Envy strangely rues his end, in whom no fault she found ;
Knowledge his light hath lost, Valour hath slain her knight :
Sidney is dead, dead is my friend, dead is the world's delight.

PLACE, pensive, wails his fall, whose presence was her pride ;
Time crieth out, "My ebb is come, his life was my springtide" ;
Fame mourns in that she lost the ground of her reports,
Each living wight laments his lack, and all in sundry sorts.

HE was—woe worth that word—to each well-thinking mind
A spotless friend, a matchless man, whose virtue ever shined,
Declaring in his thoughts, his life, and that he writ,
Highest conceits, longest foresights, and deepest works of wit.

HE only like himself was second unto none
Where death—though life—we rue, and wrong, and all in vain do moan,
Their loss, not him, wail they that fill the world with cries,
Death slew not him, but he made death his ladder to the skies.

Now sink of sorrow I, who live, the more the wrong,
Who wishing death, whom death denies, whose thread is all too long,
Who tired to wretched life, who look for no relief,
Must spend my ever-dying days in never-ending grief.

HEART'S ease and only I like parallels run on,
Whose equal length keep equal breadth, and never meet in one,
Yet for not wronging him, my thoughts, my sorrow's cell,
Shall not run out, though leak they will, for liking him so well.

FAREWELL to you, my hopes, my wonted waking dreams !
Farewell sometime enjoyed joy, eclipséd are thy beams !
Farewell, self-pleasing thoughts which quietness brings forth,
And farewell friendship's sacred league uniting minds of worth.

And farewell, merry heart, the gift of guiltless minds,
And all sports which for life's restore variety assigns,
Let all that sweet is void! In me no mirth may dwell;
Philip, the cause of all this woe, my life's content, farewell!

Nor rime, the scourge of rage, which art no kin to skill,
And endless grief which deads my life, yet knows not how to kill,
Go seek that hapless tomb, which if ye hap to find,
Salute the stones that keep the lines that held so good a mind.

QUEEN MAB

Thomas Hood, who died in 1845, was a very gifted poet and brave man. He wrote several poems that will never be forgotten, and when battling with ill-health and disease he wrote many comic poems which have set everybody laughing who has read them. For he could be humorous as well as pathetic, gay as well as sad. In Queen Mab he is neither, but just fanciful, which suits young folk best of all. Queen Mab, of course, reigns over the fairies.

A LITTLE fairy comes at night,
Her eyes are blue, her hair is brown,
With silver spots upon her wings,
And from the moon she flutters down.

She has a little silver wand,
And when a good child goes to bed
She waves her wand from left to right,
And makes a circle round its head.

And then it dreams of pleasant things,
Of fountains filled with fairy fish,
And trees that bear delicious fruit,
And bow their branches at a wish:

Of arbours filled with dainty scents
From lovely flowers that never fade;
Bright flies that glitter in the sun,
And glow-worms shining in the shade.

And singing birds with gifted tongues
For singing songs and telling tales,
And pretty dwarfs to show the way
Through fairy hills and fairy dales.

But when a bad child goes to bed,
From left to right she weaves her rings,
And then it dreams all through the night
Of only ugly, horrid things!

. . . . .

Then wicked children wake and weep,
And wish the long black gloom away;
But good ones love the dark, and find
The night as pleasant as the day.

THE SANDS OF DEE

Charles Kingsley, who wrote this fine ballad, was a master of this form of poetry. How much he can tell in so little space! Notice how the weird picture of the cruel sea that drowned poor Mary is brought before our mind's eye by the repetition of certain words in the first three lines of the second and fourth verses. It is a legend that the voice of the drowned maiden can be heard still calling the cattle home. This, of course, is one of those fancies that come to our minds in listening to the strange noises of the sea.

O MARY, go and call the cattle home,
And call the cattle home,
And call the cattle home,
Across the sands of Dee.

The western wind was wild and dank with foam,
And all alone went she.

The western tide crept up along the sand,
And o'er and o'er the sand,
And round and round the sand,
As far as eye could see.
The rolling mist came down and hid the land;
And never home came she.

"Oh! is it weed, or fish, or floating hair—
A tress of golden hair,
A drowned maiden's hair
Above the nets at sea?"
Was never salmon yet that shone so fair
Among the stakes on Dee.

They rowed her in across the rolling foam,
The cruel, crawling foam,
The cruel, hungry foam,
To her grave beside the sea.
But still the boatmen hear her call the cattle home
Across the sands of Dee.

THE TEST

Emerson here suggests—as is indeed true—that Time will at last winnow all the lines of the poets until only the sound and the true remain indestructible—five lines from five hundred it may be. By constant search wise readers and critics seek to find from the poets of all the ages, and help to treasure when found, those few deathless lines.

I HUNG my verses in the wind,
Time and tide their faults may find.
All were winnowed through and through,
Five lines lasted sound and true;
Five were smelted in a pot
Than the South more fierce and hot;
These the siroc could not melt,
Fire their fiercer flaming felt,
And the meaning was more white
Than July's meridian light.
Sunshine cannot bleach the snow,
Nor time unmake what poets know.
Have you eyes to find the five
Which five hundred did survive?

TOM BOWLING

This song by Charles Dibdin is the most popular of all sea songs, and deservedly so for its pure and simple pathos.

HERE, a sheer hulk, lies poor Tom Bowling,
The darling of our crew ;
No more he'll hear the tempest howling,
For death has broached him to.
His form was of the manliest beauty,
His heart was kind and soft ;
Faithful below he did his duty ;
But now he's gone aloft.

Tom never from his word departed,
His virtues were so rare.
His friends were many and true-hearted,
His Poll was kind and fair :
And then he'd sing, so blithe and jolly,
Ah, many's the time and oft !
But mirth is turned to melancholy,
For Tom is gone aloft.

Yet shall poor Tom find pleasant weather
When He who all commands
Shall give, to call life's crew together,
The word to pipe all hands.
Thus Death, who kings and tars dispatches,
In vain Tom's life has doffed :
For, though his body's under hatches,
His soul has gone aloft.

A CHILD'S THOUGHT OF GOD

Elizabeth Barrett Browning, the author of these beautiful verses, was a great poetess and the wife of Robert Browning, a great poet. Her pure and simple mind enabled her to see things with the clearness of a child's faith, and her power of words to express herself in noble poetry. Here she gives a wonderful idea of God's constant care and watchfulness over those of us who seek to do His will.

THEY say that God lives very high !
But if you look above the pines
You cannot see our God. And why ?

And if you dig down in the mines
You never see Him in the gold,
Though from Him all that's glory shines.

God is so good, He wears a fold
Of heaven and earth across His face—
Like secrets kept for love untold.

But still I feel that His embrace
Slides down by thrills through all things made,
Through sight and sound of every place :

As if my tender mother laid
On my shut lids her kisses' pressure,
Half waking me at night, and said :
"Who kissed you through the dark, dear guesser ?"

A RED, RED ROSE

The following is one of the most beautiful of the many love-songs by Robert Burns. The style of the song is of an earlier day than his own, and different versions of it have been printed, but it is here given as it first appeared in a Scottish collection of songs to which the poet contributed.

O MY luve's like a red, red rose
That's newly sprung in June ;
O my luve's like the melodie
That's sweetly played in tune.

As fair art thou, my bonnie lass,
So deep in luve am I ;
And I will luve thee still, my dear,
Till a' the seas gang dry.

Till a' the seas gang dry, my dear,
And the rocks melt wi' the sun ;
I will luve thee still, my dear,
While the sands o' life shall run.

And fare thee weel, my only luve !
And fare thee weel a while !
And I will come again, my luve,
Though it were ten thousand mile.

TRUE GREATNESS

The writer of this fine poem was Lady Elizabeth Carew, or Carey, who lived in the early years of the seventeenth century. She was a relative, on her mother's side, of the great poet Edmund Spenser, and died in the year 1635. The word seld in the last verse is, of course, the same as seldom, but even a poet would now hesitate to use the word, though our language has not changed greatly since the time of Elizabeth, when modern English was established.

THE fairest action of our human life
Is scorning to revenge an injury :
For who forgives without a further strife
His adversary's heart to him doth tie :
And 'tis a firmer conquest truly said
To win the heart than overthrow the head.

If we a worthy enemy do find,
To yield to worth, it must be nobly done—
But if of baser metal be his mind,
In base revenge there is no honour won.
Who would a worthy courage overthrow ?
And who would wrestle with a worthless foe ?

We say our hearts are great, and cannot yield ;
Because they cannot yield it proves them poor :
Great hearts are tasked beyond their power but seld :
The weakest lion will the loudest roar.
Truth's school for certain does this same allow,
High-heartedness doth sometimes teach to bow.

SHAKESPEARE

Matthew Arnold in this fine sonnet conveys a splendid sense of Shakespeare's eminence over all the master-minds that have written in the English language. "Others abide our question" means that, while other great poets or thinkers may be open to question, Shakespeare speaks through his immortal verse with so divine a voice that we feel it is the very voice of truth itself and cannot be questioned.

OTHERS abide our question. Thou art free.
We ask and ask—Thou smilest and art still,
Out-topping knowledge. For the loftiest hill
That to the stars uncrowns his majesty,

Planting his steadfast footsteps in the sea,
Making the heaven of heavens his dwelling-place,
Spares but the cloudy border of his base
To the foiled searching of mortality :

And thou, who didst the stars and sunbeams know,
Self-schooled, self-scanned, self-honoured, self-secure,
Didst tread on earth unguessed at. Better so !

All pains the immortal spirit must endure,
All weakness that impairs, all griefs that bow,
Find their sole voice in that victorious brow.

THE FAIRIES

Written by William Allingham, who died in 1889, this is one of the most beautiful poems about fairies. Grown-up people used to believe in fairies, and in Ireland, not so very long ago, grown-ups would talk about fairies just as children do, so that Allingham, who was born in Ireland, no doubt got to know and love the "wee folk" he sings about.

UP the airy mountain,
Down the rushy glen,
We daren't go a-hunting
For fear of little men ;
Wee folk, good folk,
Trooping all together ;
Green jacket, red cap,
And white owl's feather !

Down along the rocky shore
Some make their home,
They live on crispy pancakes
Of yellow tide-foam ;
Some in the reeds
Of the black mountain-lake,
With frogs for their watch-dogs,
All night awake.

High on the hill-top
The old King sits ;
He is now so old and grey
He's nigh lost his wits.
With a bridge of white mist
Columbkill he crosses,
On his stately journeys
From Slieveleague to Rosses ;
Or going up with music
On cold, starry nights,
To sup with the Queen
Of the gay Northern Lights.

They stole little Bridget
For seven years long ;
When she came down again
Her friends were all gone.
They took her lightly back,
Between the night and morrow,
They thought that she was fast asleep,
But she was dead with sorrow.
They have kept her ever since
Deep within the lake,
On a bed of flag-leaves,
Watching till she wake.

By the craggy hill-side,
Through the mosses bare,
They have planted thorn-trees
For pleasure here and there.
Is any man so daring
As dig them up in spite,
He shall find their sharpest thorns
In his bed at night.

Up the airy mountain,
Down the rushy glen,
We daren't go a-hunting
For fear of little men ;
Wee folk, good folk,
Trooping all together ;
Green jacket, red cap,
And white owl's feather !

GOOD-NIGHT, GOOD-NIGHT

Joanna Baillie was one of the most famous women writers in the first half of the last century. Her poetry was read throughout the English-speaking world, and several of her plays were performed with success. She wrote these lines.

THE sun is down, and time gone by,
The stars are twinkling in the sky,
Nor torch nor taper longer may
Eke out a blithe but stinted day ;
The hours have passed with stealthy flight,
We needs must part : good-night, good-night !

The lady in her curtained bed,
The herdsman in his wattled shed,
The clansmen in the heathered hall,
Sweet sleep be with you, one and all !
We part in hopes of days as bright
As this gone by : good-night, good-night !

Sweet sleep be with us one and all !
And if upon its stillness fall
The visions of a busy brain
We'll have our pleasures o'er again,
To warm the heart, to charm the sight.
Gay dreams to all ! Good-night, good-night !

LITTLE VERSES FOR VERY LITTLE PEOPLE

JOY OF L'FE

THE sun is careering in glory and might
'Mid the deep blue sky and the clouds so bright ;
The billow is tossing its foam on high,
And the summer breezes go lightly by ;
The air and the water dance, glitter, and play—
And why should not I be as merry as they ?

The linnet is singing the wild wood through,
The fawn's bounding footsteps skim over the dew,
The butterfly flits round the blossoming tree,
And the cowslip and bluebell are bent by the bee :
All the creatures that dwell in the forest are gay,
And why should not I be as merry as they ?

Mary Russell Mitford

GENTLE JESUS, MEEK AND MILD

GENTLE JESUS, meek and mild,
Look upon this little child :
Pity my simplicity,
Suffer me to come to Thee.

Fain I would to Thee be brought,
Gracious God, forbid it not ;
In the kingdom of Thy grace
Grant Thy little child a place.

Charles Wesley

THE LITTLE STAR

TWINKLE, twinkle, little star ;
How I wonder what you are !
Up above the world so high,
Like a diamond in the sky.

When the blazing sun is gone,
When he nothing shines upon,
Then you show your little light,
Twinkle, twinkle, all the night.

Then the traveller in the dark
Thanks you for your tiny spark ;
He could not tell which way to go
If you did not twinkle so.

In the dark blue sky you keep,
And often through my curtains peep ;
For you never shut your eye
Till the sun is in the sky.

As your bright and tiny spark
Lights the traveller in the dark,
Though I know not what you are,
Twinkle, twinkle, little star.

Jane Taylor

I MUST NOT TEASE MY MOTHER

I MUST not tease my mother,
For she is very kind ;
And everything she says to me
I must directly mind ;
For when I was a baby,
And could not speak or walk,
She let me in her bosom sleep,
And taught me how to talk.

I must not tease my mother ;
And when she likes to read,
Or has the headache, I will step
Most silently indeed :
I will not choose a noisy play,
Nor trifling troubles tell,
But sit down quiet by her side,
And try to make her well.

I must not tease my mother ;
I've heard dear father say
When I was in my cradle sick
She nursed me night and day ;
She lays me in my little bed,
She gives me clothes and food,
And I have nothing else to pay
But trying to be good.

I must not tease my mother ;
She loves me all the day,
And she has patience with my faults,
And teaches me to pray.
How much I'll strive to please her
She every hour shall see ;
For should she go away or die
What would become of me ?

Mrs Sigourney

WHAT MIGHT HAVE BEEN

THE little birds are singing
Above their speckled eggs,
The daddy-long-legs talks about
His children's lovely legs.

The red cow thinks her little calf
The best that there can be,
And my papa and my mamma
Are very proud of me !

And yet I might have been a bird,
And slept within a nest,
Or been a daddy-long-legs,
With scarcely any chest ;

Or been a little calf or pig,
And grown to beef or ham ;
I'm very, very, very glad
That I am what I am !

Frederic E. Weatherly

Upon yon nearest rock-top
Can you see a dwelling stands?
Ah, 'tis the sweetest dwelling
Found in these mountain lands!

It holds the sweetest lady!
She is rich with golden hair,
Has clever, busy fingers,
Though so small and lily fair.

They wash, they starch, they broider,
They can spin, mix oaten cake,
And grind the white wheat finely
The dainty loaves to bake.

And when that sweetest lady
Shall be mine, my own to hold,
Ah, Earth to match her beauty
Will wear a crown of gold!

❀

Little Robin Redbreast sat upon a hurdle,
With a pair of speckled legs and a green girdle.

❀

Baby and I
Were baked in a pie,
The gravy was wonderful hot!
We had nothing to pay
To the baker that day,
And so we crept out of the pot.

❀

Pretty flowers, tell me why
All your leaves do open wide
Every morning when on high
The noble sun begins to ride?

Rose dreamed she was a lily,
Lily dreamed she was a rose;
Robin dreamed he was a sparrow;
What the owl dreamed no one knows.

But they all woke up together
As happy as could be.
Said each: "You're lovely, neighbour,
But I'm very glad I'm me."

❀

Pussy-cat ate the dumplings,
Pussy-cat ate the dumplings!
Mamma stood by, and cried, Oh fie!
Why did you eat the dumplings?

❀

The Robin and the Wren
Fought about the porridge-pan;
And ere the Robin got a spoon
The Wren had ate the porridge down.

❀

Bless you, bless you, bonnie bee!
Say, when will my wedding be?
If it be tomorrow day
Take your wings and fly away.
Fly away east, or fly away west,
And show me where *he* lives who loves me the best!

❀

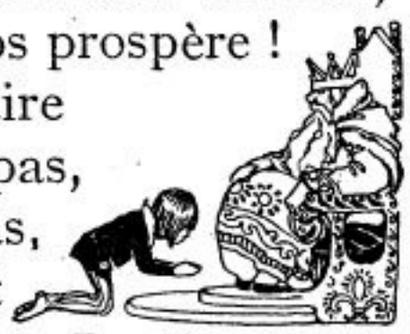
Hey, my kitten, my kitten,
And hey, my kitten, my deary;
Such a sweet pet as this
Was neither fat nor weary.

A NURSERY RHYME OF THE CHILDREN OF FRANCE

Here is a French nursery rhyme. To the little French children it is as familiar as "Jack and Jill" and "Old Mother Hubbard" are to us. The English version does not pretend to be an exact translation of the French, because it would be impossible to find one to rhyme.

AU TEMPS JADIS

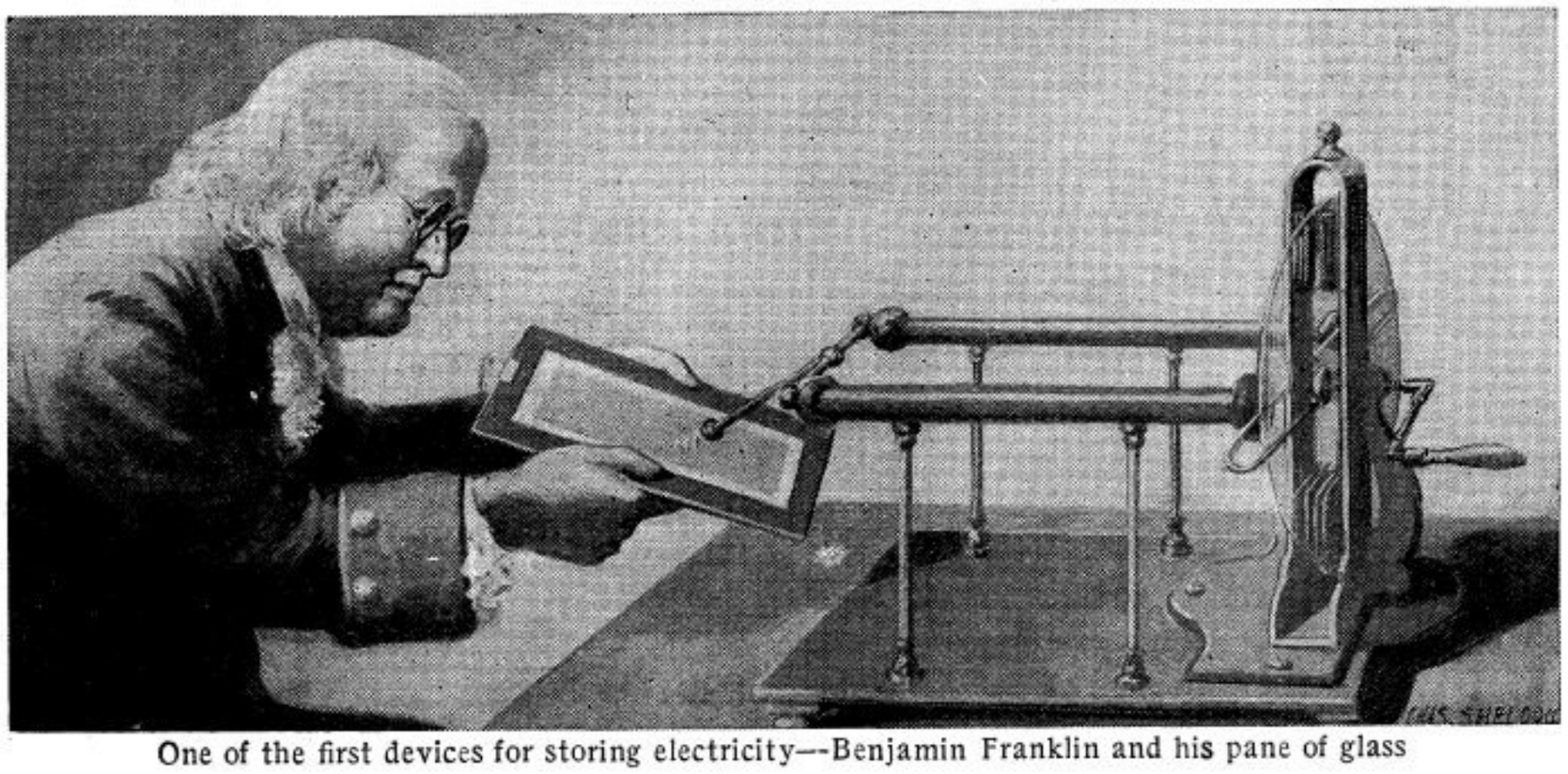
Le bon temps que c'était,
Du temps que la reine Berthe filait!
Dans ce temps de miracles
Les docteurs guérissaient sans brevet,
Et comme des oracles
Les avocats parlaient sans bonnet,
Les rois que le temps prospère!
Alors n'avaient à faire
Que leurs quatre repas,
Et se croiser les bras,
Mais cela se passait
Du temps que la reine Berthe filait!



IN THE DAYS OF LONG AGO

Oh! what a happy time, 'tis said,
When good Queen Bertha spun her thread!
For in that wonder-working day
The doctors cured, nor asked for pay;
The lawyers, men of great renown,
When pleading wore no wig and gown;
And kings who lived at that time, too,
Had very little else to do
Than eat four hearty meals a day,
Then simply fold their arms, they say;
But then this all took place, 'tis said,
When good Queen Bertha spun her thread!

The Story of Where Power Comes From, What It Does, & How It Works



One of the first devices for storing electricity—Benjamin Franklin and his pane of glass

THE STORAGE BATTERY

As long as a dynamo is driven by a steam-engine, or some other kind of power, it continues to produce electricity. As soon as it stops, the electric current it has been generating stops too.

It can thus be understood how necessary it is to be able to store up the output of current so that it can be rationed out to the various users as they require it.

The storage battery, or *accumulator*, does more than this. A dynamo can be run all night when the world is at rest and no electricity is wanted, and its output can be stored up in an accumulator. The next day, when there is a big demand for current, the reserve store of the accumulator can be added to the dynamo output.

There are many instances where a store of electricity is absolutely necessary. The case of the electric car is one. An electric delivery van, or carriage, can usually run for a distance of fifty or sixty miles, its supply of current being self-contained or stored up in a battery fixed in a box beneath the body.

Many wireless receivers are now made to run directly off the house supply, but many also require a two-volt accumulator to heat the filaments of the valves. Thousands of small portable accumulators are used in this way. Every motor-car is provided with a storage battery. This is charged by a dynamo, driven by the petrol engine, and stores up energy as the car is running, which provides current for the lamps, the self-starter, and often the wind-screen wiper.

One of the first instruments for storing electricity was invented by Benjamin Franklin and was known as Franklin's pane. It was a pane of glass with a large sheet of tinfoil pasted on each side, and by connecting it with a frictional machine it was possible to store a certain amount of static electricity. But static electricity, as we have seen, has entirely given place to the more powerful currents of the galvanic or voltaic battery, or the dynamo, and as such currents produce very pronounced chemical changes it followed that the storage battery was devised.

A battery which could be charged with electricity and could be made to give the electricity back again was discovered in 1860 by Gaston Planté. It consisted of two sheets of lead rolled up together, with strips of some insulating material such as flannel between them, to prevent the two plates touching one another. This roll of the separated lead plates was placed in a mixture of sulphuric acid and water, and the current from a dynamo was connected

with the two plates until bubbles of gas were given off at their surface. On disconnecting the cell, and connecting its plates with some apparatus requiring a current, such as a lamp, it was found that the cell gave out the electric energy that had been produced and stored within it.

An electric storage cell may be looked upon as something capable of receiving, retaining, and giving up again the energy put into it from a dynamo or from an ordinary electric battery. Such a cell must not be thought to store electricity *as electricity*. The electric force put into the cell is changed into chemical energy, and this chemical power is again turned into electricity when the cell is discharged.

THE TRANSFORMATION OF MECHANICAL POWER INTO CHEMICAL ENERGY

Here, indeed, is a wonderful example of the different forms in which power can exist. A great rock high up on some mountain slope possesses power, for if it were dislodged it could drop down upon something below and crush it. The stick of dynamite used by the miner to break up the rock is harmless enough to look at, yet on exploding it releases the energy of a hundred horses. In the accumulator mechanical power that has already been turned into electric power is once again changed into silent chemical energy. The joining up of the two ends of the accumulator with an electric motor will release the chemical energy and endow the motor with power to work a machine.

The modern accumulator, used on an immense scale today, is simple in construction. The positive and negative elements, or plates, are made in the form of flat grids, lead perforated or honeycombed, and filled with a paste of oxide of lead.

THE PRESSURE WHICH MAY EQUAL 200 TONS IN MAKING A CELL

In the type of plate invented by Faure red lead oxide is used in making the positive plates, and on the passage of an electric current gives a final hard paste of lead sulphate and lead peroxide. The negative plate, on the other hand, is filled with litharge, which becomes reduced to a spongy black form of lead when the cell is charged. These pastes are forced into the lead grids under great pressure, sometimes equal to as much as 200 tons.

The amount of electricity that can be stored in an accumulator depends very largely on the area of the plates, and in order to keep each cell of a convenient size the larger ones are made up of a number of positive and negative plates placed alternately in big glass vessels, all the negative and all the positive plates being connected together so that in each cell there are just the two terminals, positive and negative.

The average voltage of a cell is only two volts, so that where an accumulator battery is wanted for electric lighting fifty or a hundred or more cells must be used, according to the voltage of the lamps. By connecting the positive of one cell to the negative of the next, and so on—which is called joining the cells *in series*—the voltage becomes multiplied by the number of cells.

The amount of electric energy that may be stored in a battery depends on the area of the surface of the positive plates in any one cell. If the battery could light a hundred lamps, each requiring an ampère of current for ten hours, the " capacity " of the battery would be 100 multiplied by 10, or 1000 *ampère-hours*.

THE STORAGE OF ELECTRIC POWER LIKE THE WINDING OF A SPRING

Six, eight, or twelve-volt accumulators for lighting motor-cars are usually of from 20 to 60 ampère-hours' capacity. Thus the *voltage* of an accumulator depends on the number of cells that are connected in series, and the *capacity* depends upon the number of square inches of surface of the positive plates in one of the cells.

What is the secret of these simple grids that lie inert-looking in a vessel of weak sulphuric acid? What happens when energy is stored up in the plates, or robbed from them? There has been no little discussion among electricians as to what really does happen, but there is no doubt that the real elements that play their parts are very finely divided lead metal in the negative plate and peroxide of lead in the positive plate. When energy is being stored up in the cell, metallic lead is deposited on the negative plate, and sulphuric acid is generated, while oxygen is set free at the positive plate, forming oxide of lead.

These chemical changes represent the storage of electric power. It is like winding the spring of a clock, which tries hard to unwind, and in so doing drives the clockwork mechanism until the spring is unwound. In a similar way the lead

deposited on the negative plate tries to combine with the sulphuric acid to form sulphate of lead, and in so doing it releases hydrogen gas, which travels in the form of *ions* to the positive plate, combines with oxygen, and causes a compound of lead to be formed. This at once unites with the sulphuric acid to form sulphate of lead. The accumulator can be charged and discharged thousands of times.

WHY THE ACCUMULATOR MUST BE CHARGED FROM TIME TO TIME

The accumulator thus serves not only as a store of power, but as a stand-by against a generating station breakdown.

So many small accumulators are used today for electric lighting, motor-car ignition, and wireless receiving sets that some remarks may well be made about their general behaviour and upkeep.

There are two serious faults in the lead accumulator. One is the weight; the other the fact that a charged battery when not in use will gradually lose its electricity. Both these faults have been in some measure overcome in recent years.

Accumulators must be charged with current from time to time, and are quickly ruined if they are allowed to stand "empty" for any length of time.

When freshly charged, each cell will give rather more than two and a half volts, and if the accumulator be made to light a lamp the voltage will soon drop to two volts, and will then remain fairly constant until about three-fourths discharged, when it will drop in voltage by a quarter-volt. This would mean a serious drop in a large battery of a hundred cells, for the voltage would drop from 250 volts to less than 180, and the electric lamps supplied by the battery would noticeably diminish in brightness. Hence the electrical engineer must be provided with a battery sufficiently big never to be too much "run down," or else he must have auxiliary cells that can be added to the battery to increase its voltage when low.

THE ACID AND PURE WATER IN THE BATTERY CELLS

The lead grids must be always just covered with acid, and to make up for evaporation a little distilled, or pure, water must be added from time to time.

In many batteries of the portable type, the acid is mixed with glass wool or a special kind of chemical jelly so that the acid cannot spill.

The great weight of a lead accumulator is of little moment when used, as it largely is, at generating stations, for there its power can be added to that of the dynamos at periods of "heavy load." But we have to look forward to something of a revolution in our means of light traffic when some form of really light and portable battery is discovered.

If we could store sufficient energy within a really light battery to drive a motor-car the ease and simplicity of its operation would probably make many people prefer it to the petrol engine. The chief feature of such a car is the complete freedom from vibration, and many vans delivering fragile goods are run from storage batteries for this reason. Ambulance vans are sometimes run by electricity for the same reason.

The solution, however, has been found already to some extent. Edison invented a storage battery in which iron and nickel take the place of lead; these metals are only one-fourth of the weight of lead. Year after year the great American inventor toiled at his experiments, and ultimately he was rewarded with success.

THE EDISON ACCUMULATOR THAT CAN DRIVE A CAR FOR FIFTY MILES

In his battery the positive plates consist of tubes of nickel-plated steel held in a nickelled steel frame. The tubes are made from finely perforated strips and are filled with nickel hydroxide and thin layers of plate nickel. The negative plate has twenty-four flat pockets of nickel steel finely perforated and filled with oxide of iron. A solution of caustic potash is used in place of the sulphuric acid of the lead battery.

Many of these Edison batteries are used today, though they have by no means replaced the standard types of lead battery. But Edison was able to equip a comfortable little brougham type of car with a light battery containing sufficient electricity to drive it for fifty or sixty miles, and this was a great advance on anything that had been done previously in the way of an electric vehicle. The electric carriage, self-contained, had in fact become a real and practical thing.

But the lead battery still possessed many advantages. It was left to a Canadian inventor to discover a form of accumulator that has put a new complexion on the problem of electric traffic. A lead

accumulator was discovered which could not only be charged with electricity in a few minutes, but would retain the power imparted to it by a dynamo for almost any length of time. The new discovery showed a way of making a plate offer an immensely greater surface, and thus the weight of the battery could be reduced to one-quarter of what had previously been considered necessary.

SMALL BATTERIES WHICH RETAIN THEIR POWER FOR LONG PERIODS

Improvements in storage batteries have been made by many other people, and it is now possible to make lead plates of far less weight than before which will not only retain their charge for a long time but will occupy a much smaller space. A new type of accumulator which has come into use is composed of very small cells, to take the place of the little dry batteries which are so largely used in ordinary wireless sets.

Every train carries a storage battery under each of its coaches. These are charged by dynamos coupled directly with one of the axles and provide the carriages with light. In some cases small trains themselves are being driven by power obtained from storage batteries. Battery-driven electric engines are used in mines for hauling coal and carrying men, but the submarine is probably the best known example of battery work.

One of the most successful types of power battery was invented by an Irishman named Drumm. The Drumm battery can be charged, like the Edison, at a very high speed and it will stand discharging at a tremendous rate without injuring the plates. This quick charging of traction batteries is very important, as it means that they can be charged with electricity in fifteen or twenty minutes against the twelve hours or more which are required for the ordinary type of cell.

HOW THE GRID HAS MODIFIED THE SCOPE OF THE STORAGE BATTERY

This means a great deal to an electric vehicle. When it runs out of electricity it can be replenished almost as quickly as a petrol car can fill up with spirit.

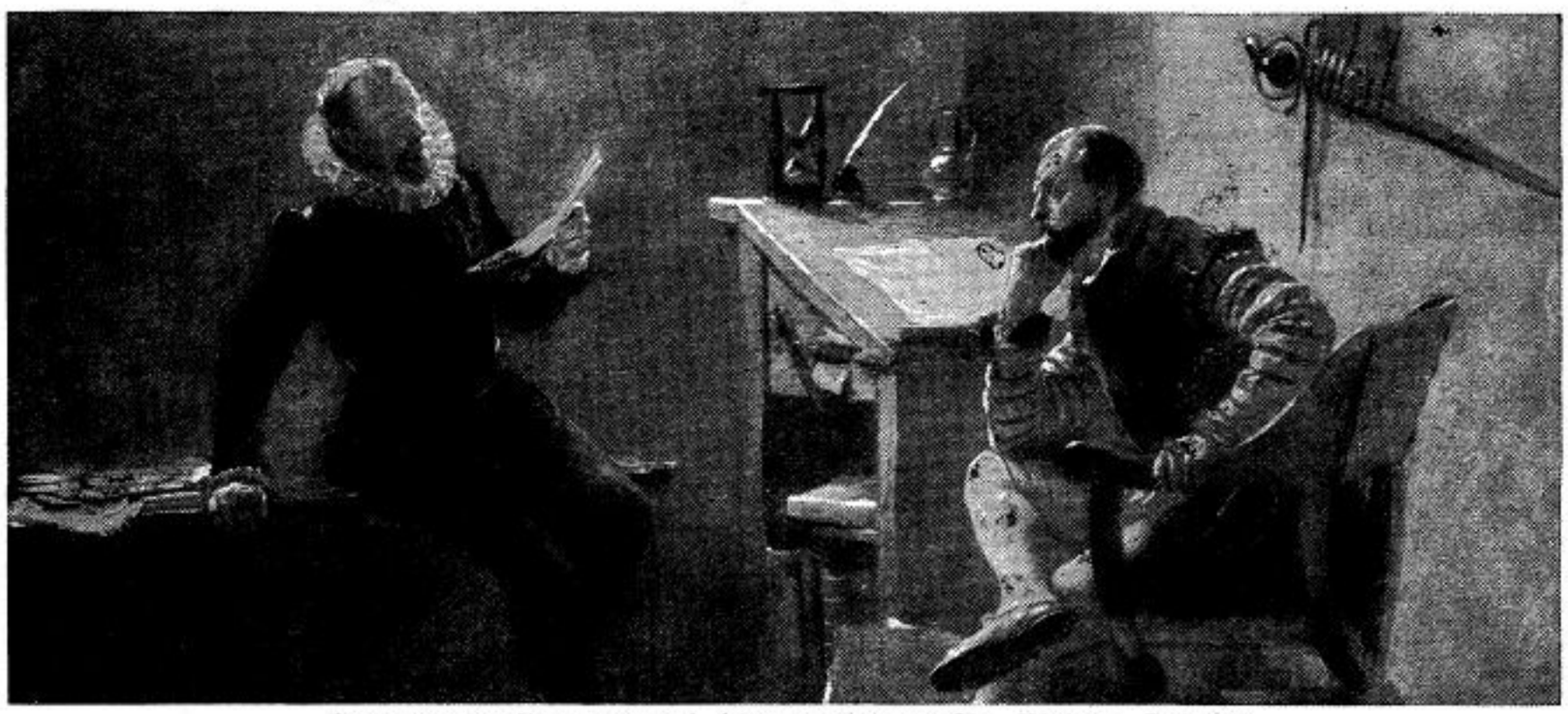
The electric grid has largely modified the scope of the storage battery. The enormous voltage at which current can be transmitted for long distances with overhead wires makes it possible to supply a locomotive with direct power all the way along a line for hundreds of miles. With direct current this would be impossible, as the loss would be far too great. The high tension electricity supplied by the grid is, however, *alternating*. The poles of the dynamo become alternatively positive and negative in respect of each other many times every second. In order to charge an accumulator with current supplied by the grid it is necessary either to rectify it so that it can be applied to the battery afterwards in one direction, or it must be used to drive a motor which in turn will drive a direct current dynamo.

Suppose the electric car were of twenty horse-power and with a fully charged battery would run for ten hours. If the motorist wanted to refill his battery in half an hour he would have to " pour in " electric current on a scale of 400 horse-power ! Quite special electric supply mains and switchboards would be required to deal out huge currents like this. Yet it is the only alternative to taking ten or twelve hours to re-charge the battery. If you have to charge up hurriedly it must be done at a tremendous rate. As the electric car becomes more general, a new type of supply station will become necessary and will surely be provided, for the electric car is certain to play a very important part in the traction of the future.

SPLITTING UP THE VAST ENERGY OF THE WORLD'S POWER INTO SMALL UNITS

A fascinating feature of the accumulator plate or grid is that when it is once charged with electricity in its liquid cells it can be actually removed, dried, and sent away to some distant place, when, as soon as it is set up again in a vessel filled with acid, it will give out its pent-up energy.

As surely as power in the form of oil or petrol can be sent from the bowels of the Earth to some other continent across the sea in a tank steamship, so electric power can be sent from one spot to another in the form of " potential " energy stored up in the chemical composition of the accumulator grid. The battery of the future will provide a new means of splitting up the vast energy of the world's power into small units, and distributing it in new ways, and electric motors, battery driven, will play a far greater part in the work of small factories, and become more universally adaptable to the service of mankind.



Spenser reading one of his poems to Sir Walter Raleigh

THE POET WHO FOLLOWED CHAUCER

IF, five years before the death of Queen Elizabeth, anyone had asked in London who was the greatest poet of that time, when English literature was approaching its topmost height, the answer given would not have been William Shakespeare. The answer of the poets themselves, and they were many, would have been Edmund Spenser.

And we can understand, though no one would give the same answer now, that it was a natural reply to give then, and not absurd. For poetry had not at that time begun to include plays as the most splendid part of her wide domain.

Blank verse, the form in which our grandest poetry is written, had only recently come into use, and had not been enriched with the finest thought in the world of books outside religion. Poetry then was rhymed verse, and the greatest mass of English rhymed verse, sweet beyond all other verse in the English tongue, had been written by Edmund Spenser. If we were still thinking of poetry as rhymed verse only, or chiefly, we should give Spenser a place on the list of poets alongside the greatest.

So we must not pass him lightly by. He was the one great poet between Chaucer and Shakespeare—a period of 200 years—and he had as lasting an influence on English poetry as Chaucer had. Chaucer fixed the language and made it melodious; but his melody had not been sustained. Spenser revived the melody of our tongue, and so added to it that his tunefulness has been echoing through English poetry ever since. He is known especially as the poets' poet.

There are two reasons for that distinction. One is that nearly all his poems are purely fanciful. They do not deal with human life and character, as poetry did when it again enlarged its bounds by taking in great plays, as in the far-off days of the Greek drama. Spenser's poems are concerned with pleasing creations of the mind, dainty fancies, pretty parables with graceful and often useful meanings; but they are not concerned with the common stuff of plain life. It takes a poet to appreciate them fully. And then, again, they are deliciously sweet in their wording, and that feature can be appreciated best by fellow poets.

Yes, to the men of his own day he was their leading poet, though Shakespeare was alive, and no doubt knew Spenser. They did not quite overlap. Shakespeare was twelve years younger than Spenser, and was a lad of fifteen when Spenser was acknowledged as the poet of his period. When Spenser died, thirteen years before

Shakespeare died, the greater poet had not written his greatest works, and, indeed, Spenser, in his " Tears of the Muses," referred to " our pleasant Willy."

> That same gentle Spirit from whose pen
> Large streams of honey and sweet nectar flow,

was not writing what made his fame. It is now Spenser himself who somewhat more than satisfies us with his " honey and sweet nectar," while Shakespeare's bounty, left to all succeeding ages, is illimitable.

Chaucer, Spenser, and Milton are the only men in our list of the conspicuous English poets who lived an active public life apart from their work as poets. They were alike in being first and foremost poets born, yet they drudged at the kind of duties we now call Civil Service. Spenser frankly hated his task work.

LONDON BOY WHO WROTE A CALENDAR FOR COUNTRY MEN

He was London born from a Lancashire stock, and on leaving Cambridge sought a career at the Court, where he was a friend of Sir Philip Sidney, and associated with the Earl of Leicester, an acquaintance that did him no good when that nobleman fell from royal favour.

Before he obtained official employment as Secretary to the Lord Lieutenant in Ireland, he had published his Shepherd's Calendar, a pastoral poem that gave him the first place among contemporary poets, and showed his skill in using a wide variety of verse forms while commemorating the twelve months of the year.

The Shepherd's Calendar, an entirely artificial poem, as far from real life as the make-believe play of imaginative children, showed at least that Spenser had a quick sense of style in writing, and style was much admired in the days when the old literatures of Greece and Rome were being revived, and the newer literature of Italy was setting the fashion.

THE GROUP OF KINDRED SPIRITS WHO BRIGHTENED THEIR AGE

Spenser's greatest friend was Sir Philip Sidney, himself a poet and a most elaborate stylist in prose writing. Also Sidney was a man of singular purity of character and nobility of spirit, and Spenser showed himself a kindred spirit in all his writings. Walter Raleigh was another member of the same company. What a knightly group they must have made—Sidney, Spenser, Raleigh ! Perhaps Sidney was fortunate in his early death, for he left a spotless name ; while Spenser and Raleigh lived on into grave misfortune.

Sent to Ireland, then as now a land of strange violence, the poet felt himself to be in exile ; but his value as a secretary was known—he proved it by writing a prose book on the state of Ireland—and he was kept there in spite of all his plans for release, and for employment under happier surroundings.

It was in Ireland that he planned the twelve books of his Faery Queen, the fanciful poem that preserves his fame ; and there, too, he wrote six books of this work which still exist. Some of the poem was lost, and the rest not completed ; but to us that does not matter, for we have as much of it as we want.

Spenser's weaknesses as a writer were, first that he had not the power of making a clear and manageable tale, but became involved as " in endless mazes lost," and then that his writings were far off from real life. He lived in a twilight of romance, amid shadowy figures. And, as suited this fanciful world of the mind alone, his diction was continuously sweet and melodious, with words as well as tones that were, even then, purposely old-fashioned.

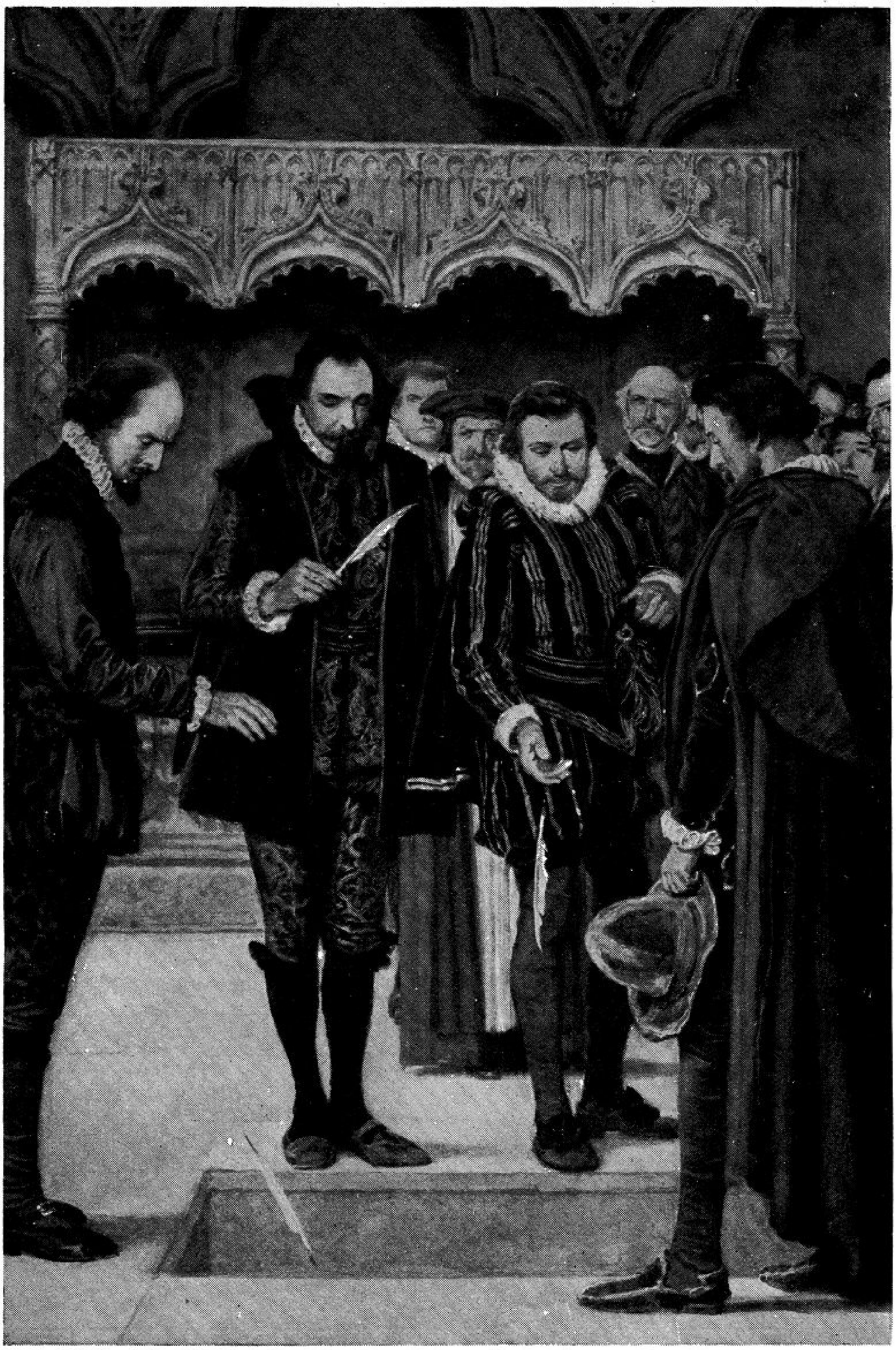
THE POEM OF THE FAERY QUEEN WITH A REAL QUEEN IN IT

And so he has sweetness without strength. But sweetness was what the literature of our country needed just then. It had had more than sufficient ruggedness in the immediate past as it was splashed forth from the spluttering pens of poets like John Skelton.

The Faery Queen suited the age for which it was written, an age that has Sidney's Arcadia as its most popular prose romance. The poem was really a poetical dressing up of the old entertainment that was called a Morality Play. Certain virtues and their opposing vices were pictured as knights or ladies, or as monsters or tempting witcheries, and engaged in mildly adventurous contests.

Thus Holiness, Temperance, Chastity, Justice, Courtesy, and other benign figures came into contact with Falsehood, Pride, Unbelief, Lawlessness, and other harmful influences, amid surroundings that are wholly fanciful and strange. The poem is a collection of allegories ; but it is complicated by the characters having a

POETS DROP THEIR PENS IN SPENSER'S GRAVE



POOR, TIRED, AND WORN OUT, SPENSER WAS LAID TO REST IN A GRAVE IN THE ABBEY INTO WHICH HIS POET FRIENDS THREW MOURNFUL POEMS AND THE PENS THAT HAD WRITTEN THEM

second meaning beyond their moral teaching. The more prominent of them were designed to represent living people, with Queen Elizabeth as the centre of the group. All this personal reference is useless lumber now, and only some of the moral suggestions remain; but what is left of real value is much pure poetry in singularly melodious words. Spenser, indeed, bequeathed to those who have followed him a style well worth knowing, but to be used with discretion.

THE POETS WHO FLUNG THEIR POEMS AND PENS INTO SPENSER'S GRAVE

How well his fellow poets appreciated him was seen when, driven from Ireland in great danger during one of the many insurrections that broke out, he arrived in London ill and impoverished, and there died before his sorry plight was fully understood. His funeral in Westminster Abbey was attended by a concourse of his fellow poets, who, acknowledging him as a master in the divine art, threw their pens and poems into his grave.

As examples of the mellowness of Spenser's fancies and of the tones in which they are expressed, we may take two scenes in which the good people he pictures are being lulled into a sense of peace and security in order that they may be the better tempted. The first is a gentle knight who finds himself resting in a magician's hut while passing through the wandering wood of Error.

And more to lull him in his slumber soft,
A trickling stream from high rock tumbling down,
And ever drizzling rain upon the loft
Mixed with a murmuring wind, much like the sound
Of swarming bees, did cast him in a swowne.
No other wise, nor people's troublous cries
As still are wont t'annoy the walléd town
Might there be heard; but careless Quiet lies
Wrapt in eternal silence far from enemies.

THE MAJESTIC STANZA INVENTED BY EDMUND SPENSER

This is the nine-lined verse which Spenser invented, and which, known as the Spenserian stanza, has been used by many later poets, notably by Byron in Childe Harold. It consists of eight lines, each with ten syllables or five beats, followed by a ninth line of twelve syllables, or six beats, that ends the stanza with a lingering, restful sound that may with the use of dignified words become majestic. An even better example is to be heard in the description of the Bower of Bliss of an enchantress, where all kinds of sweet sounds unite to charm those who are being tempted to their ruin.

Eftsoons they heard a most melodious sound
Of all that might delight a dainty ear,
Such as at once might not on living ground
Save in this paradise, be heard elsewhere.
Right hard it was for wight who did it hear
To rede what manner music that might be;
For all that pleasing is to living ear
Was there consorted in one harmony—
Birds, voices, instruments, winds, waters, all agree!

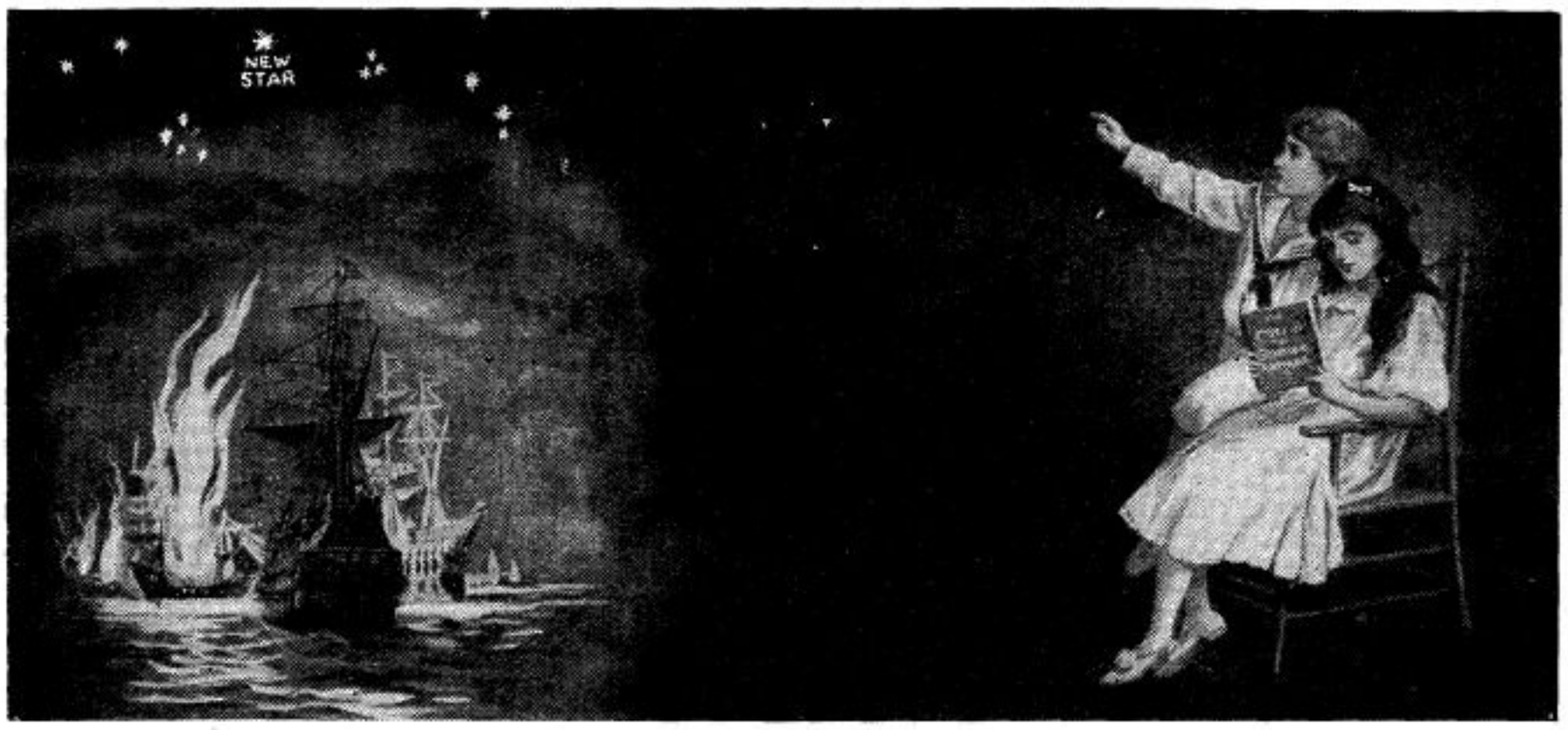
The joyous birds, shrouded in cheerful shade,
Their notes unto the voice attempered sweet
Th' angelical soft trembling voices made
To th' instruments divine respondence mete;
The silver-sounding instruments did meet
With the bass murmur of the water's fall;
The water's fall, with difference discreet,
Now soft, now loud, unto the wind did call;
The gentle warbling wind low answerèd to all.

THE MOST BEAUTIFUL WEDDING POEM IN THE ENGLISH LANGUAGE

Besides his Faery Queen and Shepherd's Calendar, Spenser wrote with equal sweetness on love in its most refined forms.

His Epithalamion, written to commemorate his marriage when he had reached the substantial age of 42, is the most beautiful poem of its kind in the English language. It overflows with admiration of his bride's beauty, alike in form and character. His Prothalamion, hymning the marriage of two pairs of friends, is scarcely less successful. In it Spenser tells, in outline, the story of his own life, for he is one of the poets who, happily, has not hesitated to intermingle his personal affairs with his lyrical outpourings, and so provide posterity with facts that otherwise might not have been known. Even his courtship is traced in the sonnet form which he was foremost in introducing from the Italian tongue.

His personal poems, Mother Hubbard's Tale, and Colin Clout's Come Home Again, expressing his longing to leave his Irish exile, and the Tears of the Muses, regretting the decline of poetry—a bad instance of misjudgment—are all interesting historically; but it is his mixture of dainty fancy with the melody of words that gives him a secure place in our literature. As has been said by a fine critic, in words worthy of Spenser himself, in the pageant of the English poets Spenser should ride on a white horse and blow a silver trumpet.



Immense Distance in space—Watching a star whose light left on its journey at the time of the defeat of the Spanish Armada by Sir Francis Drake, taking three hundred years to reach the Earth

DISTANCE

ONE night a lady said to a visitor: "We find it a great nuisance having our post-office half a mile away."

At that moment her husband entered the room. "I have been looking at Saturn," he said, "a glorious sight." "Ah," said the visitor, "that is farther off than your post-office!" "It is eight hundred and eighty-three million miles from the Sun," replied the astronomer.

Distance can be a great nuisance and a great blessing. Even a mile may be a nuisance when we are tired, or a quarter of a mile when a swimmer is seized with cramp at this distance from the shore; and yet what a blessing it is that the Sun is so far away from the Earth, and the arctic regions from our British Isles!

The queer thing about distance is that it varies with circumstances. If you were staying at a house thirty miles away from a cathedral city, and the only means of getting there was a donkey-cart, the distance would seem for your purpose something like the distance of the Moon from the Earth. But if your host had a good pair of horses, you would reckon your visit to the city as a day's work; if he kept a high-powered motor-car you would consider the visit as a morning's excursion; if he drove an aeroplane, you would think of the city merely as a milestone on your way from one side of England to the other.

Like everything else in the world, distance is *relative*. You can think of it only in relation to something else. It is a good distance from London to York, but how trivial that journey seems when we think of the distance from Liverpool to Quebec. But the journey from London to York would seem infinitely farther than the journey from Liverpool to Quebec if we walked the one and made the other by an aeroplane.

There is another strange way of looking at distance. A young Indian student once said to the writer, "The steamship has enormously increased the distance between England and India." What did he mean? In the old days of the sailing ships Englishmen returned home to the British Isles only at very long intervals of time; and so they lived for years together in India, and got to know the people intimately, and a real affection existed between them—the affection of knowledge. But now that the steamship makes the journey so quickly, Englishmen go home almost every year, and no longer regard India as their other home, with the result

that *the distance between the Englishman and the Indian is greater than it was before the invention of the steamship.*

This moral distance is well worth thinking about. You may know one man for years, yet never know him at all ; something in him keeps you at a distance. But you may meet another person for the first time and feel in half an hour that you know all about him ; something in him destroys the distance between you. The French have a striking phrase of this " something : " they call it *le terrible don de la familiarité*, which means, " the terrible gift of intimacy." But it need not be terrible : the power which destroys the distance between one soul and another is sincere affection, and this power must be unselfish to do its work.

One other aspect of moral distance is extremely interesting. There is no geographical distance so great as the distance between an illiterate person and the highest pleasures of human existence. A savage standing in the great reading-room of the British Museum would be as far away from the delight and beauty packed into those shelves as a butterfly in Devonshire from the chrysanthemums of Japan. A child who learns to read is building himself an airship which will annihilate the distance between him and El Dorado. He may be poor, yet richer than Solomon ; he may be weak, yet stronger than Samson ; he may be solitary, yet the friend of kings. What the steamship and the airship do to physical distance, education does to moral distance.

ONE OF THE GREATEST WORDS IN THE POLITICS OF THE WORLD

At the present moment distance is one of the greatest words in the politics of the world. Most people in the British Isles want Europe to forget war, to banish hate, to settle down to work hard and live happily. But some people in France exclaim : " Ah, you would change your tone if you had no North Sea between you and the Prussians. How would you like it if you were next door to your enemies ? "

The answer we make to this objection shows how wonderfully the human mind is turning its attention more and more from mere physical distance to moral distance. We say to these French people : " It is true that you are much nearer to the Germans than we are, and we sympathise with your anxieties, which are perfectly natural after the late war ; but we suggest to you that the moral distance between you is so tremendous that it makes your physical nearness a still greater inconvenience. We think you would not be disturbed by that physical nearness if you destroyed the moral distance between you and your neighbours by sympathy and friendship."

This idea is the inspiration of those of us who believe in the League of Nations. We say that wars are made by nations living at great moral distances from each other, and that if those distances can be destroyed we shall have peace on Earth, goodwill among men. We argue that if the railway, the steamship, the aeroplane, the cable, and the wireless telegraph can destroy geographical distance, so the spiritual nature of man, if it is developed, can destroy the moral distances which imperil the world's peace and rob us all of a reasonable prosperity.

THE LIGHT OF STARS THAT PERISHED MILLIONS OF YEARS AGO

This same idea is to be found in all true religion. There are people who say : " How absurd it is to suppose that God takes any interest in our ridiculously little planet swimming like a grain of sand in the boundless ocean of ether ! Consider the question of star distances. They overwhelm us, they crush us to the Earth, they annihilate the idea that we are of any importance to the universe.

" Why, so far away are the stars from this little Earth that their total light, as far as we are concerned, is represented by the effect of a one candle-power lamp at a distance of twelve yards. The distance of the nearest fixed star is three thousand times the diameter of the solar system. Think of this : 200,000 light years equals more than one million million million miles ! Many of the stars we see in the sky may have perished millions of years ago, the light which still reaches us from them being vibrations in the ether, which began their journey before ever this Earth was made. And yet men speak of God, and a life after death ! "

GOD THE CREATOR AND SPIRIT OF THE UNIVERSE

Religion replies to these people who say this by asking them : " How do you reach up into the heavens to take the diameter of the solar system, to measure the suns, to weigh the planets, to fix the position of invisible stars ? You do that by means of instruments. You invent instruments which annihilate these immense distances. So we, by prayer and love, destroy the distance which separates the creature from the

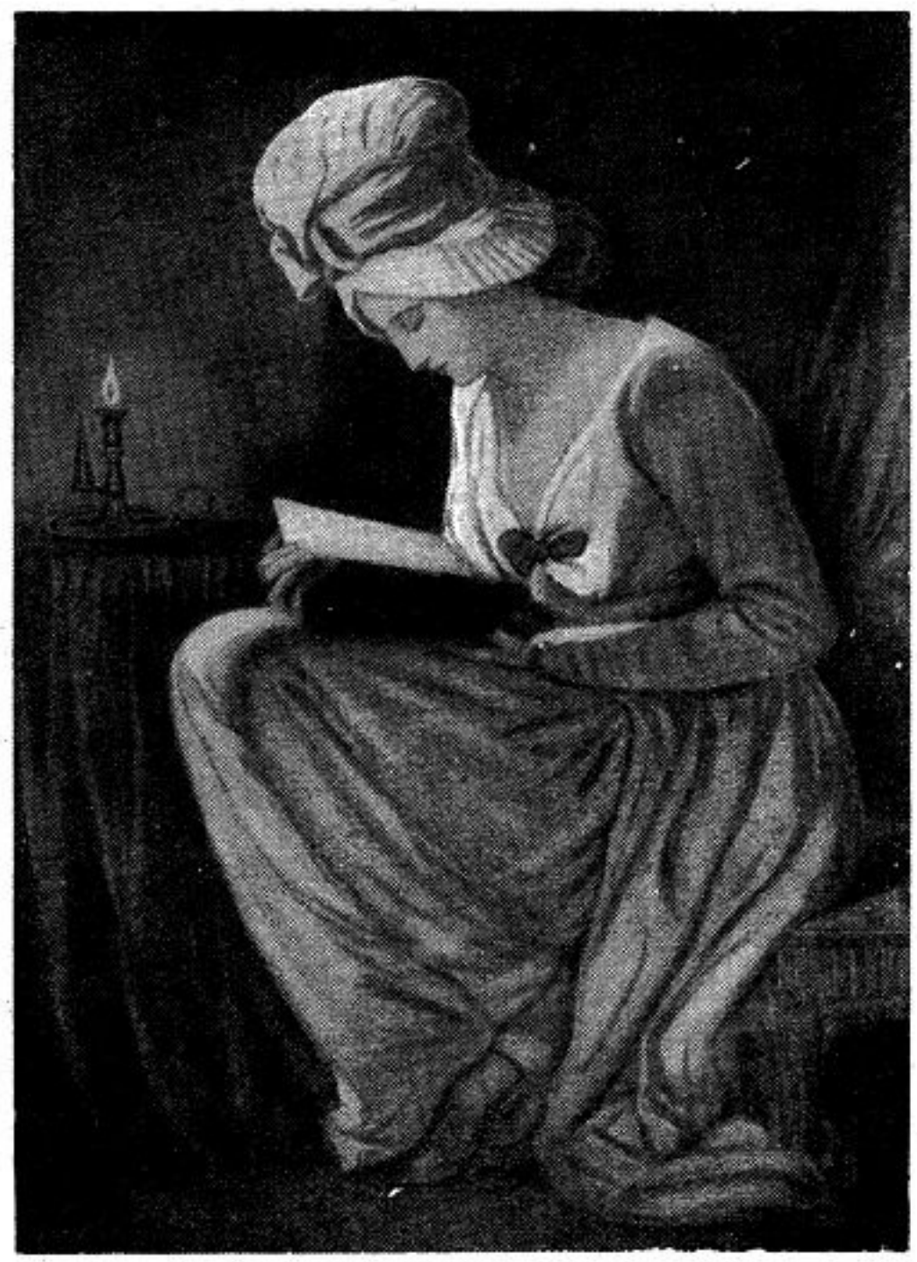
Creator. Small our Earth may be, but it is a part of the universe ; a thing of three-score-years-and-ten may be the creature man, but he is mind, and what else is real but mind ? Nothing ; not even distance."

Thus it comes about that men no longer think of God as a great potentate living at so crushing a distance from this planet that He neither sees us nor heeds us. We think of Him as the Spirit of the whole universe, and feel that He hears us even when we do not utter the thoughts and longings of our hearts, and that He cares for us even when we wander far from the path He has chosen for our advance.

Inspired men caught this idea of *God's immanence*, as we now call it, long before the era of modern science.

Whither shall I go from thy Spirit (cries the psalmist), or whither shall I flee from thy presence ? If I take the wings of the morning and dwell in the uttermost parts of the sea. even there shall thy hand lead me, and thy right hand shall hold me.

The only distance which exists between the Creator and the creature is the moral distance made by sin. But even that distance vanishes away into unreality as soon as the hardened heart breaks with repentance. No utterance of human lips concerning distance is so moving as the words of Jesus in His story of the prodigal son : " *But while he was yet afar off* his father saw him, and was moved with compassion, and ran, and fell on his neck, and kissed him." Their appeal is universal.



ALL DISTANCE IS CONQUERABLE BY KNOWLEDGE : ROMNEY'S PORTRAIT OF A READING GIRL

All distance exists only for those who are " afar off." There is no distance between Homer and our own day for the scholar of Greek literature ; no distance between Earth and sky for astronomers and poets ; no distance between God and man for those who love goodness. All distance is a relative thing, as Einstein and others have shown. Great is the distance between a European navvy and a pygmy of Darkest Africa, but not greater than the distance between that navvy and men like Kelvin and Pasteur. To destroy distance we must destroy ignorance. Our sailors have destroyed the ignorance which kept the savage man in his hollowed tree trunk, our investigators of the ether have destroyed the ignorance which rested its faith in the telegraph wire and the deep-sea cable, our physicians have destroyed the ignorance which imprisoned the human mind in magic, and our idealists are destroying the ignorance which keep the nations sundered by hate and fear.

All distance is conquerable by love and knowledge. The word means *standing apart*. It represents the *stance*—the position—of the human mind. Let that stance be one of love and longing, and the object, moved by compassion, comes toward us, compelled by that moral earnestness of our heart and mind to yield us its intimacy.

The thought of vast distances can never overwhelm a mind which has reflected deeply enough to see that all distances are its own creation. The philosopher learns from the astronomer that the Earth moves to points two hundred million miles apart, and from the physicist that it would take millions of atoms to cover an inch in a straight line, each of these atoms containing electrons which have as much space to move about in, relative to their size, as the Earth in the sky ; and the philosopher hears these wonderful tidings with neither dismay nor despair, for he has learned to think of the whole universe as the creation of Mind.

Therefore, with quiet heart and steady gaze, he looks toward the infinitely Great and the infinitely Small, seeing them not separated by incalculable distances, but as a unity in which he, too, has his place.

JACOB DECEIVING HIS BLIND FATHER—STEALING THE BIRTHRIGHT FROM ESAU

AND JACOB WENT NEAR UNTO ISAAC HIS FATHER: AND HE FELT HIM, AND SAID, THE VOICE IS JACOB'S VOICE, BUT THE HANDS ARE THE HANDS OF ESAU

The Story of the Most Beautiful Book in the World

ISAAC AND HIS SONS

ISAAC, son of Abraham, was married to Rebekah, and he loved her tenderly.

He became a rich man. He not only increased his flocks and herds, but set himself to plough land and grow corn. His courage and his skill both helped to make his wealth. When famine came he did not sit down and mourn, but moved away to more fertile country, and made a fresh start.

When his wealth made other people envious, and they stopped up his wells so that his flocks and herds might perish, he quietly set himself to dig other wells and prayed to God for His protection.

God, who had blessed Abraham, blessed his son Isaac, and appeared to him in the midst of his troubles, saying: I am the God of Abraham thy father ; fear not, for I am with thee, and will bless thee, and multiply thy seed for my servant Abraham's sake.

Isaac rested in this promise. His character was so calm and noble, his life so honourable and beautiful, that even those who had sought to do him harm became his friends, and confessed that God had blessed him.

After nineteen years of marriage, Rebekah gave birth to two sons, Esau and Jacob. The joy of Isaac was now complete. His farming prospered, his heart was filled with peace, and his sons grew up in health and strength to rejoice the eyes of his age.

These two boys were very different in character. Esau, the elder, was what we should call an outdoor lad ; he loved riding and hunting, he was strong and powerful, he rejoiced in the splendid and dangerous risks of a wild life. Jacob, on the other hand, was a quiet and thoughtful lad ; he was adored by his mother, who kept him at her side, and he preferred thinking to action.

We can imagine how his mother would tell him of his wonderful grandfather, the rich and powerful Abraham, who had seen visions of God, and to whom God had made the promise that his children should be a great nation. Jacob would think much of these things

Esau probably thought little about Abraham and his dreams. All he cared about was the joy of hunting and the exercise of his bodily strength. In some ways he was a fine character, for he was free from avarice—he did not think how rich he would be when his father died, and he was not proud of being the eldest son and the heir.

He married women of a tribe which greatly displeased his father. He did not care. He probably laughed when his father

reproved him. And yet we know that in spite of this disobedience Isaac loved his brave, gallant, and wilful son.

Reckless and wild was this bold hunter. He came home one day hot and weary from the chase, and found Jacob preparing a dish of food, the smell of which was very pleasant to him. He asked for it, and Jacob replied that the food should be Esau's if Esau would give him his birthright. Esau agreed; for a dish of food, because he was hungry and faint, he gave up his privilege as the eldest son of Abraham's son, Isaac.

HOW JACOB AND HIS MOTHER DECEIVED THE DYING ISAAC

Such were the characters of these two men. Esau, reckless and careless, but brave and generous; Jacob, gentle and thoughtful, but inclined to cunning.

When their father Isaac was an old man, and his eyes were dim, he called Esau to his side, and told him to take bow and arrow and go out to shoot venison and return to him with the meat, that he might lay his hands upon his eldest son and bless him.

Rebekah heard these words, and directly Esau had gone she whispered to Jacob that he should go and kill two kids, and she would make meat of them, and he should carry it to his father and receive the blessing. It was the advice of a mother tempted by love for her favourite child; and Jacob agreed to do as she desired, only saying that he feared to be discovered. "Behold, Esau my brother is a hairy man, and I am a smooth man: my father peradventure will feel me, and I shall seem to him as a deceiver."

THE STEALING OF THE BIRTHRIGHT AND THE GREAT BITTERNESS OF ESAU

Then Rebekah dressed him in Esau's clothes, and put the skins of animals on his arms and neck. They set themselves to deceive the blind, old, dying man.

Jacob carried the meat to his father, and his father was surprised. They spoke together in this manner, the father troubled by suspicion, the son trembling with shame and fear:

ISAAC: Who art thou, my son?

JACOB: I am Esau thy firstborn; I have done according as thou badest me. Arise, I pray thee, sit and eat of my venison, that thy soul may bless me!

ISAAC: How is it that thou hast found it so quickly, my son?

JACOB: Because the Lord thy God brought it to me.

ISAAC: Come near, I pray thee, that I may feel thee, my son, whether thou art my very son Esau or not. The voice is Jacob's voice, but the hands are the hands of Esau. Art thou my very son Esau?

JACOB: I am.

Thus Jacob received the blessing.

When Jacob had gone out, and Isaac lay alone in the dim chamber, thinking of God's promises to his father Abraham, and praying that the son whom he had just blessed might receive the guidance of God, lo! there came in to the poor old man his son, his elder son, Esau, whom he loved with a deep passion.

Isaac his father said unto him, "Who art thou?" And he said, "I am thy son, thy firstborn Esau." And Isaac trembled, and said, "Who? Where is he that hath taken venison and brought it me, and I have eaten of all before thou camest, and have blessed him? Yea, and he shall be blessed."

When Esau heard the words of his father, he cried with a great and bitter cry, and said unto his father, "Bless me, even me also, O my father!"

ONE OF THE MOST PATHETIC SCENES IN THE STORY OF THE WORLD

This scene is one of the most pathetic and beautiful in all the writings of the world. Who cannot see the horror in the dying, sightless eyes of the grand old farmer, and the bitter repentance of the reckless son as he knelt there, knowing, too late, that he had squandered his birthright? We can almost hear the sobbing of the hunter, and see the trembling of the dying patriarch.

Esau's fury against the brother who had supplanted him was deep and terrible. He vowed to kill him. But Rebekah heard of this, and, making a pretence that she wished Jacob to marry one of their own people, she persuaded Isaac to let Jacob go to her brother Laban, who lived far away, and there find a wife.

Her purpose was to send Jacob away only until Esau's wrath had vanished; but her purpose was frustrated by the will of God. She had sinned; she had taught Jacob to deceive, and her sin, though prompted by love, must meet its punishment. In kissing her son and sending him away for a few weeks, she was parting from him for ever.

The Interests and Pleasures of Life for All Indoors and Out

THINGS TO DO WITH NAILS & SCREWS

EVERYONE thinks he can drive a nail or put in a screw; and while such tasks may be quite easy, there are a number of hints about nails and screws that every boy, and every girl too, should know.

If we have to drive nails into hard wood we should touch the end of the nails with lard or tallow, when they will be found to go in much more easily and to drive more accurately than if we do not take this simple precaution.

Deal boards, such as are used for rough shelves, often split when nails are driven into them. To prevent this we should hold the nail upside down with its head on the ground and give the point a tap with the hammer to blunt it slightly.

Nails used for fences and in other positions out of doors very quickly rust, and lose their strength and value. To prevent this we must treat the nails before they are used. We take a pint of linseed oil, and mix it with two ounces of ordinary blacklead, stirring them well together. Then we heat the nails red hot, and place them in the mixture for some time. Afterwards we take them out, let them drain, and shake them together in an old bag. The nails will thus be prevented from rusting.

Another method, which is perhaps simpler though not quite so effective, is to heat the nails as before and put them in a pot of grease. Any kind will do, however coarse, provided it has no salt in it.

To draw a rusty nail from wood is sometimes rather difficult, but it may be rendered easier by giving the nail, before we attempt to draw it, a sharp tap with the hammer. This will loosen the rust that holds the nail so tightly to the wood.

In driving in nails we should always hold the hammer by the end of the handle, and get a good swing on it. This adds to the force of the blow. Short, sharp taps are of very little use. They drive the nail only a short way and usually send it in a wrong direction. Good, firm blows right on the head of the nail should be given.

When buying screws we should see that the heads are sound and the groove for the screw-driver well cut. The body and the thread should have no flaws, and the point should be sharp and turned like the point of a gimlet.

If we have to drive screws into soft wood where they are inclined to work loose, we can get over the difficulty by dipping them into warm, thick glue, and driving them into the wood quickly while the glue is liquid. They will then hold firmly. If, on the other hand, we want to put screws into wood for a time only, we can make them capable of coming out more easily by dipping them in oil.

To prevent screws rusting they should be warmed and dipped in linseed oil or melted tallow. A rusty screw is often very difficult to remove, but it may be loosened by holding a punch or big nail to the head of the screw and giving one or two sharp taps with the hammer. If this does not loosen the screw, hold a heated iron upon the head till the screw is hot, and it will turn easily.

In driving screws we should first drill a hole about the same length as the screw with a gimlet about half the diameter of the screw. The screw-driver, when used, should be held in a straight line with the screw, so that it may exert its full force.

LITTLE PROBLEMS FOR CLEVER PEOPLE

THESE problems are continued from page 626, and below are answers to the problems appearing on that page.

47. When Will They Meet Again?

"My watch gains ten seconds an hour, and my clock loses ten seconds an hour," said Tomkinson. "I put them right at noon on June 1. When will they be together again?"

Can you tell?

48. How Much was the Picture?

"You can have that picture framed," said the dealer, "for 42s., or in another frame only half the value of this for 36s."

How much was the picture unframed?

49. Could She buy the Books?

"That set of books is £5 5s.," said Joan, "and I am afraid I have not enough money." "But you have £2 2s. more than I have," said Janet, "and we have £9 between us."

Had Joan enough to buy the books?

50. Did He lose money?

"I have just sold two houses," said Thomson, "for £990 each. On one I lost ten per cent. and on the other I gained ten per cent." "Then you are exactly where you were," replied his friend.

Was he correct?

51. How were the Doctor's visits divided?

"My doctor's bill for last quarter," said the squire, "came to £9 19s. 6d." "How often did the doctor come?" asked his friend. "Twelve times," replied the squire. "He charged me a guinea a visit for each night visit and half-a-guinea for each day visit."

How many night visits did the doctor put down on his bill?

52. Did He Catch the Train?

"The station is twelve miles away," said a cyclist at a hotel, "and I have an hour and a half to catch the train. There are four miles uphill, which I must walk, and can do at four miles an hour; there are four miles downhill, where I can coast at twelve miles an hour; and there are four miles level, which I shall do at eight miles an hour. This is an average of eight miles an hour, and I shall be just in time."

Did he catch the train?

53. What were the Two Sums?

"I have two invoices," said the merchant, "which together amount to £34. In one the pounds, shillings, and pence are equal. In the other the pounds are twice the shillings and the shillings are twice the number of pence."

What were the two sums of money?

54. How Long to Mow the Field?

Evans and Watson mowed a field in a certain time. If each had mown half the field Evans would have worked one day less and Watson two days more.

How long were they mowing the field?

55. How Long did the Frog Take?

A frog fell into a well that was 30 feet deep. He climbed up 3 feet every day and slipped back 2 feet every night.

How long did he take to reach the top?

56. How many Trees in the Orchard?

In an orchard there are only apple trees, pear trees, and cherry trees. One-third of the whole are apple trees, one-fourth are pear trees, and there are 30 cherry trees.

How many trees does the orchard contain?

THE ANSWERS TO THE PROBLEMS ON PAGE 626

39. Yes, the second farm was the bigger, and was more than twice as large as the other. Three miles square is 3 miles each way and contains 9 square miles, while the other farm contained only 4 square miles altogether.

40. He knew the name of the village from which he had come, and by supposing that the arm of the signpost with that name pointed in the direction from which he had cycled, he was able to tell what roads were indicated by the other arms.

41. He was right. Feathers are weighed by avoirdupois weight and gold by troy weight. An ounce troy has 480 grains, but 1 ounce avoirdupois has only 437½ grains. But a pound troy has only 12 ounces or 5760 grains, while a pound avoirdupois has 16 ounces or 7000 grains, so that an ounce of gold is heavier than an ounce of feathers, but a pound of gold is lighter than a pound of feathers.

42. If 225 men took 7 months to make 21 miles of railway, they would take 9⅓ months to make the remaining 29 miles. If 225 men would take 9⅓ months to do something, the same work could be done in 5 months by 435 men. He therefore engages an extra 210 men.

43. To walk at 4 miles an hour means 1 mile in 15 minutes, 5 miles an hour is 1 mile in 12 minutes. So, at the quicker rate, William takes 3 minutes less for each mile, but for the whole distance he takes 15 minutes less. Therefore, the number of miles is the number of 3's in 15—that is, 5 miles.

44. There is an odd 2½d. in the total, and no shillings; and the same is true of the cost of each rug. Therefore there must have been 1 rug more than a number which costs an exact number of pounds. Now, £1 is 96 times 2½d., so that 96 rugs is the smallest number which cost an exact number of pounds, the cost being £961. Therefore twice 96 cost £1922, which is within the right amount—that is, it consists of 4 figures, beginning with 1. Hence the number of rugs is 1 more than twice 96, which is 193; and the entry should have read: 193 rugs at £10 os. 1½d. each = £1932 os. 2½d.

45. 6000 tons. It is plain that 160 tons is the difference between three barge-loads and one barge-load, so that each barge held 80 tons. And there were 75 barge-loads in the cargo, so that the total was eighty times 75 tons—*i.e.*, 6000 tons.

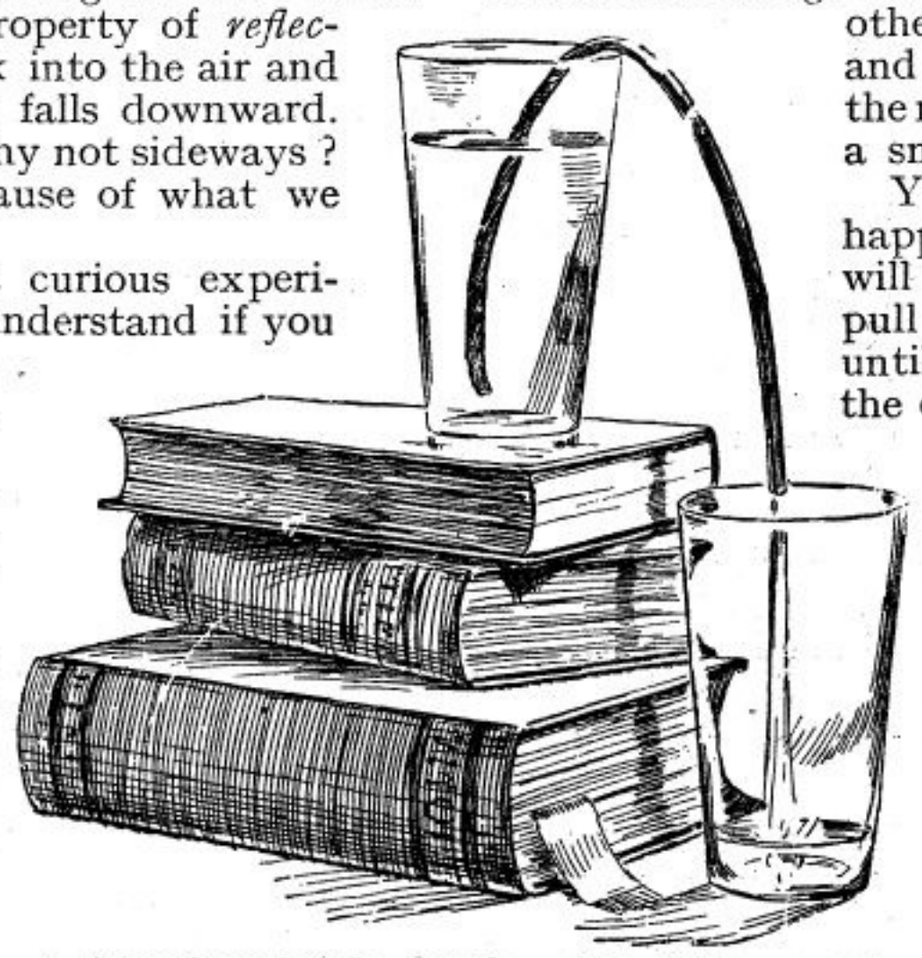
46. Three ducks.

THE MAGIC OF A GLASS OF WATER

For every mystery there is an explanation. We are sometimes a very long time finding the explanation, but the more we know about the true meaning and the properties of things the more mysteries we are able to explain; and as soon as we can explain a mystery it ceases to be one.

Look at your face in a mirror. Why does the mirror show everything in front of it? Because it has the property of *reflection*. Throw this book into the air and see what happens. It falls downward. Why not upward? Why not sideways? It falls downward because of what we call *gravitation*.

Now we will try a curious experiment, which you will understand if you understand what gravitation is. All you need are two tumblers, a little water, and a short piece of india-rubber tubing. Any sort of tubing would do, but it should be small and thin, like the tubing of the old-fashioned feeding-bottle. Put a tumbler of water on some books on a table—on anything that will cause it to stand a few inches higher than it would stand if you were to put it on the table.



1. A simple syphon showing how water will flow upward

Now put an empty tumbler on the table near the high tumbler. The tumbler holding water will then be higher than the empty tumbler. Put the end of the rubber tubing into the glass of water. Let it go down in the water. Now put the other end of the tubing into your mouth, and suck some of the water up. When the tubing is full of water, squeeze the end of the tube which you have in your mouth. Take it between your finger and thumb, holding it tightly, and put this end into or over the empty tumbler, still keeping the other end of the tubing below the surface of the water in the high tumbler. The part of the tubing dangling over the side of the full tumbler should be longer than the part inside the full tumbler.

Now if you take away your fingers, thereby letting the lower end of the tubing open, the water will begin to flow, and will continue to flow until the high tumbler is empty, or until the water in the high tumbler is below the end of the tubing up which the water has been flowing. You have made what is called a *syphon*—not the kind that holds soda water, for this is not a true syphon, but what men of science and engineers understand by the word.

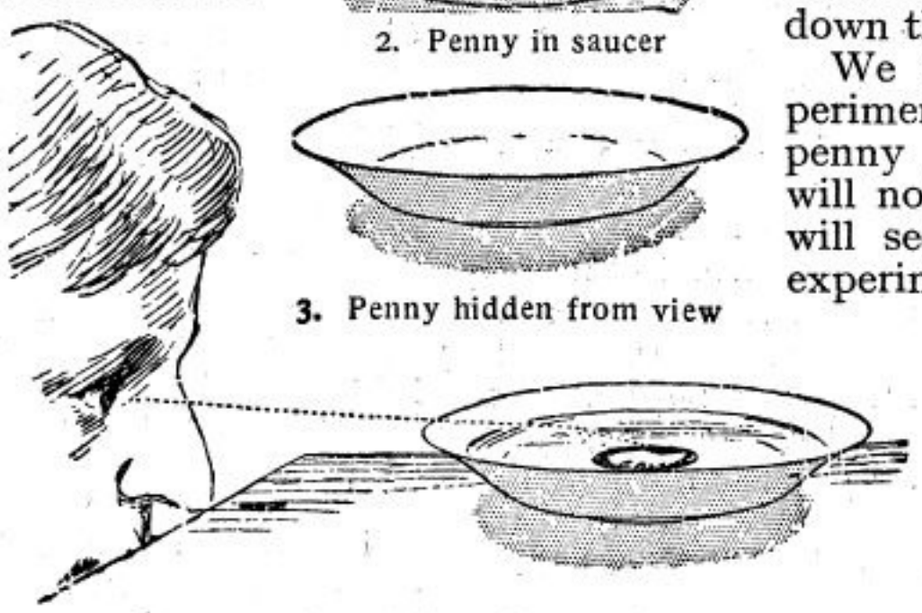
Can you explain what has happened? Suppose, for example, you take a string, tying to one end a large stone or weight, and to the other end a small weight, and suppose that you put the middle of the string over a smooth rail.

You know what will happen: the heavy stone will immediately fall and pull up the little weight until it follows it down the other side of the rail

The water in the long leg of the tube is like the heavy weight, and the water in the short one is like the small weight. But you say that the two weights would be tied together, while water is not tied to water. That is true; but unless air gets into the tube of your syphon the effect is just as if the heavy column of the water were tied to the light column of water. Perhaps it would make it clearer if we were to say that the heavy column of water falls down and *sucks* up the lighter column. The light column of water then becomes the heavy column, and sucks up more water, and so on until all the water possible has been sucked up and flowed down the tube.

2. Penny in saucer

3. Penny hidden from view



4. How we see through air and water

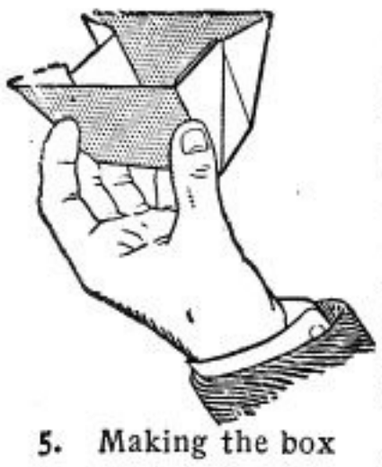
We shall try another experiment—how to make a penny rise up in water. It will not really rise up, but it will seem to do so, and the experiment is a very curious one. It shows that we do not see through water quite in the same way as we see through air.

Put a saucer on a table or on a sideboard, and put a penny in the middle of it. It will then look as shown in picture 2.

Now get someone to look at it. Ask him to sit a little lower until the penny is just hidden by the rim of the saucer. He will see the saucer, but not the penny. It will be like picture 3.

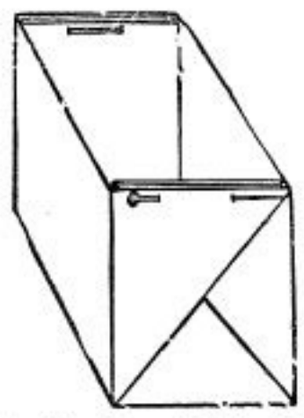
Now, while your friend sits still, pour water into the saucer. Do it very steadily

so as not to spill the water. The penny will come into sight. It does not really rise. It is the water that makes it seem to do so. This is because, when you look through air, you see in a straight line. When you look through air and water you see lines, as along two trated in picture 4. This curious property of water is called *refraction*. You will know more about this property of water when you begin to study the subject which we call *physics*.



5. Making the box

Another experiment shows yet another curious thing. To talk about a paper saucepan seems absurd, but it is not so ridiculous as it sounds. We can really make water boil in a paper saucepan without much difficulty. First we must make the saucepan. Take a piece of paper—ordinary writing paper will do. Fold it over something of square or oblong shape, as seen in picture 5. Put a pin through the folds at the sides, as seen in picture 6, to make the box keep its shape. Now put a thin piece of string round the two pins the parts of box, and hang inside the box, or hold up the paper hand. Pour it in your into the some water till it is paper box Do it very almost full. not to break gently, so as Then hold the paper box. a fire or gas the box over



6. The box finished

ring. The paper will not burn, as we might expect, but the water will get hotter and hotter till it boils. This result, which seems strange, comes about because the water will not allow the paper to retain the heat, but draws it to itself.

The effect is due to what is called *radiation*. Instead of getting hotter and hotter until it burns, the paper gives its heat to the water, which gets hotter and hotter.

HOW TO MAKE SWEETS AT HOME

We are all fond of sweets, but perhaps some of us have never tried to make our own. Many kinds of sweets are so simple to make, and give such little trouble, that we may like to try some of these recipes.

BURNT ALMONDS

Dissolve 1 lb. of brown sugar in a teacupful of water, and stir this in a pan over the fire till it comes to the boil. Cease stirring for two or three minutes; then add ½ lb. of blanched almonds, and stir quickly till the sugar browns and coats them. Turn them on to a wire sieve to cool, dividing any that may have become joined together.

PEPPERMINT CREAMS

Mix in a basin 3 ozs. of arrowroot with three gills of cold water till smooth. Put this into a lined saucepan with 1 lb. of white sifted sugar, and stir it over the fire. Let it boil for ten minutes; then move the saucepan off the fire, but stir the contents till cool.

Flavour with a few drops of peppermint essence. Take up lumps of the mixture, roll them into little balls, and put them on a slab of marble that has been buttered slightly to prevent sticking. When cold roll the creams in icing sugar.

These sweets are also made by flavouring fondant mixture with peppermint.

CREAM FONDANTS

Put into a pan on the fire 2 lbs. of granulated sugar, and pour on to it a small teacupful of hot water. Allow this to boil about eight minutes, or till it thickens, but on no account stir it. To test it take up a little on a clean wooden skewer. If a thread forms on taking a drop between the thumb and first finger and separating them, pour the mixture into a bowl, and, while warm, beat it with a wooden spoon till creamy.

As the mixture cools flavour it with vanilla, raspberry, or some other essence, and colour half of it pink with cochineal, and mould into the required shapes.

CHOCOLATE CREAMS

Take some of the fondant mixture and roll it into balls with the hands. Place the balls on a sheet of oiled paper and leave it for twenty-four hours. Cut up about a quarter of a pound of some unsweetened chocolate and soften it in a pan standing in another one of boiling water. Add to the chocolate two tablespoonfuls of water and 2 ozs. of icing sugar, and stir it till smooth. A tiny lump of butter and a few drops of cream improve the chocolate.

Dip the fondant balls into the mixture and get them out on the end of a fork and lay them on paper to cool and dry.

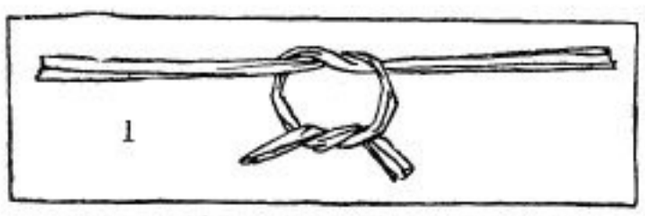
BARLEY SUGAR

Put into a pan and boil 1 lb. of loaf sugar, a small teacupful and a half of water, and a tiny pinch of cream of Tartar. Test it by dipping in a wooden skewer and plunging this in cold water. If the sugar is brittle it is ready for the addition of the juice of a quarter of a lemon and a little saffron colouring. Let it boil to 300° Fahrenheit by the thermometer, pour it on to a sweet-oiled marble slab, and cut it into strips with scissors. Twist these and store them in air-tight glass bottles.

A BASKET OF RAFFIA WORK

RAFFIA is another name for bass, which we use in the garden for tying up plants. It hangs in a familiar yellow bunch in the greenhouse, and we all know it quite well. Here we are going to learn how to make a bag with it.

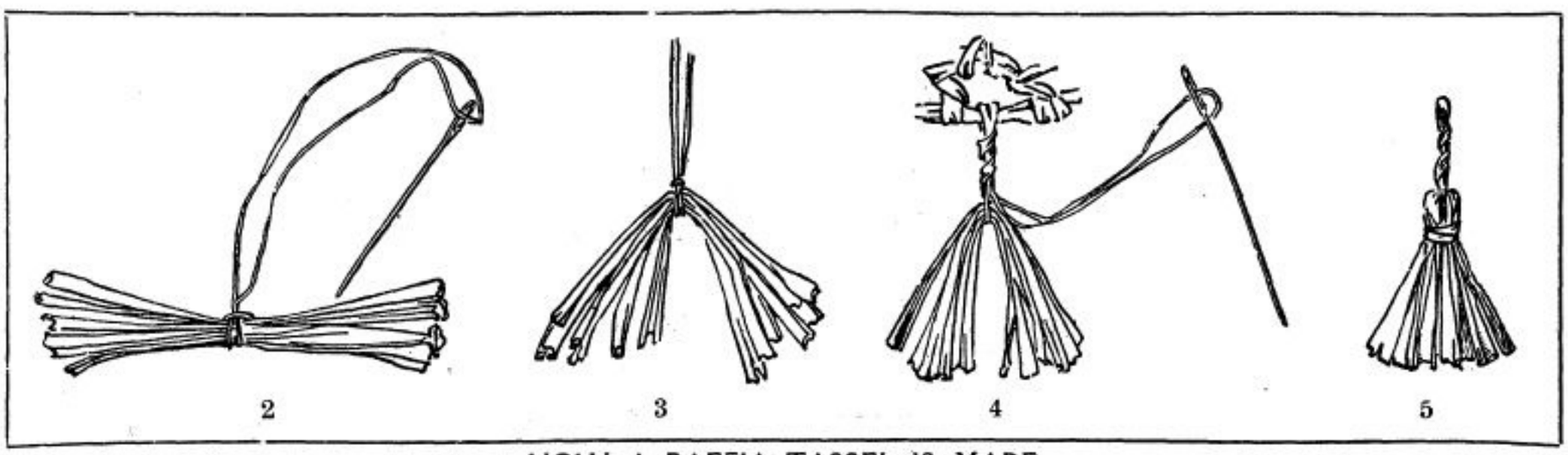
There are two kinds of this material, one a little coarser in texture than the other. This is really the bass, and it comes from the bark of the lime-tree; while the raffia, which is finer, is made from a palm grown in Madagascar. Specially prepared raffia may be had at all good fancy shops in hanks. As it can never be got in very long pieces frequent joins are necessary, and the simplest way to join it is to make an ordinary knot and cut the ends off neatly—but not too closely or it will come undone again—for we are going to use raffia like wool, and work it into a basket with a crochet-hook, afterwards plaiting a handle, and finally decorating it with small tassels.



HOW TO JOIN THE RAFFIA

We must use a bone crochet-hook of medium size, and the secret of success is to work very loosely. Each loop must be sufficiently large for the next one to be pulled through easily.

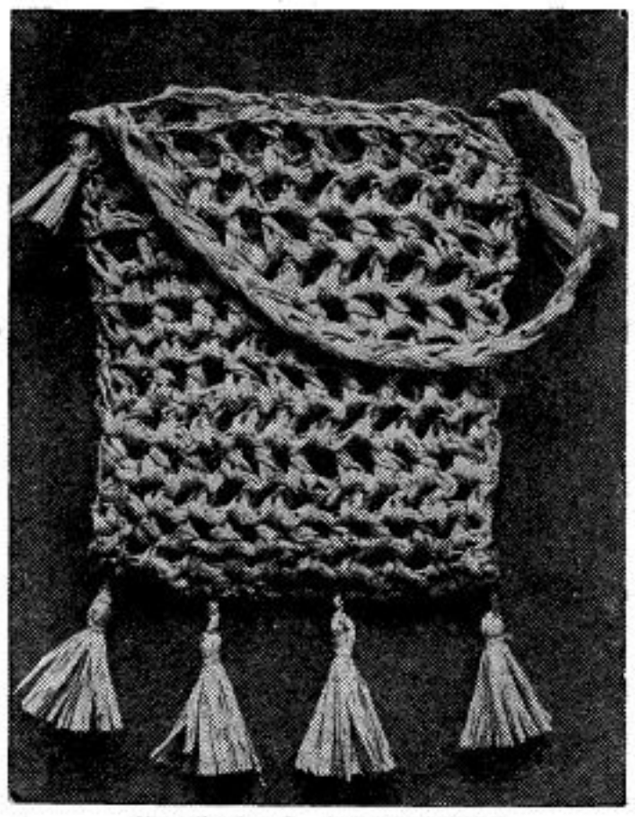
To begin our bag, we make 20 chain stitches; return, making one treble into each alternate chain, missing the chain in between, but making one chain between the trebles. The next row is made of one double crochet into the hole formed between the two trebles, and one chain in between each double crochet, so that there will be 10 chain and 10 double crochets in each row. This makes the body of our basket, and is continued backward and forward for 22 rows. The 23rd row is the same as the 22nd, a line of trebles and chain. We must adjust with our fingers, and straighten out our work if necessary, as we go along. We finish off in the usual way, and press our strip of work with a warm iron.



HOW A RAFFIA TASSEL IS MADE

When we get our bundle of raffia we undo it and shake it out, then we select about forty of the nicest and longest strands having as nearly as possible an equal thickness. There are always one or two unsatisfactory strands in every bundle. Those with a hard, green edge are not nice to work with, for they split as we twist them round the crochet-hook. We knot our strands of raffia together, cutting away any thin, straggling ends, and winding it round a postcard as we join it.

The knot to use is shown in picture 1. We tighten it by pulling both ends and both strands from either side *together*, and then pinch the ends back along the strand with the fingers to make them lie flat. It is best to leave about an inch, and if the ends do not work in we can cut them off from our basket afterward. This is a pleasanter task than it sounds, as the raffia has a very fresh, hay-like smell, which comes out delightfully as we handle it.


THE BAG COMPLETE

Any projecting ends are now snipped off with the scissors, and we proceed to make a bag of our strip by folding it in half and joining up the two sides. To do this we take a darning-needle with a big eye, and thread it with a *thin* strand of raffia, and sew the sides together with over-and-over stitches. If neatly done the join will hardly show. The four tassels ornamenting the bottom of our bag are made of six or seven stout strands three inches long. We tie them across the centre, as shown in picture 2, with a double strip of fine raffia, threaded through a needle. We must pull it tight, and pinch the two ends together, as shown in picture 3. But before we quite finish the tassel, or give it its little "waist," we attach it to the bottom of the basket by passing the needle through a double stitch, drawing the tassel nearly up to the basket, leaving a quarter of an inch of raffia, round which we wind our thread. We insert the

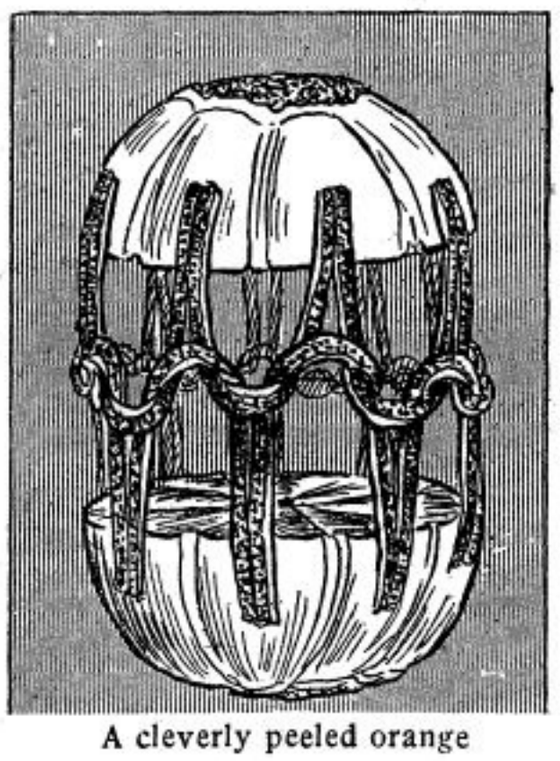
needle in the tassel again, and come out just low enough to make the "waist," as shown in picture 4. A double twist round the raffia will do for this, and then we make a knot to keep the bind firm by making a buttonhole stitch into the bind. We pull it tight, and cut off our thread, leaving the end as long as the tassel. We do not cut it off short, because raffia is so springy that it might come undone. There are four tassels, and each one is, of course, made and fixed in the same way.

Now for the handle. We take six strands of stout raffia, thirteen inches long, and plait them together in twos—just as we plait our hair—tying the ends for the time being with a piece of cotton to keep them together. To fix the handle to the basket we undo one end of our plait for about one and a half inches, take three strands, and thread them between a treble at the side of the top of the basket. We pull them all together again, and join them to the other three strands with a bind, which is made by winding a thin thread round and round, as we have learnt to do for the tassels. For these two tassels we shall need to go round several times, and must finish off with *two* knot stitches this time, for the handle has to bear a greater strain than the tassels on the bottom. We fray out the remaining end of the plait which forms the tassel, and cut off any uneven ends, fix the other side of the handle in the same way, and our bag is finished.

If the raffia is hard when we buy it, it can be plunged into hot water and left until cold; removed, shaken, and used when dry. It will then have become quite soft and pliable.

CURIOUS WAYS OF PEELING AN ORANGE

THERE are various ways of peeling an orange which give very artistic effects, and which can be done quite easily with a little practice. With a sharp knife we cut a number of slits from the top to about two-thirds the distance down the orange, and then gently and carefully pull away the peel all round from the white of the orange. We take the orange itself away, and open out the gores, or cuts, and we have a water-lily. If a night-light be put in the middle and lighted, the effect is very pretty.

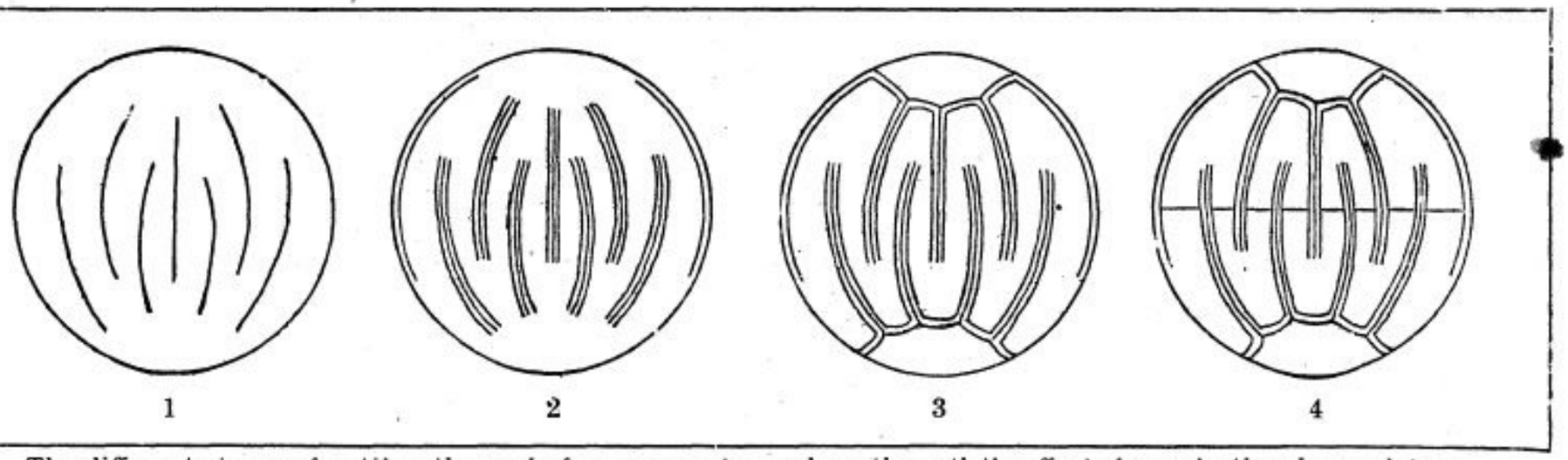


A cleverly peeled orange

A more elaborate way of cutting the peel of an orange gives the beautiful result shown in the picture. First of all we cut lines all round the orange as in picture 1; then on each side of these cuts, and about three-sixteenths of an inch away from them, we must cut other lines parallel to those already made, so that we now have the orange with a series of triple cuts as shown in picture 2. These cuts must now be joined up at the top and bottom of the orange as shown in picture 3, and then across the middle of the orange we cut the peel between the lines, as shown in picture 4. All is now ready, and with a small, blunt penknife we gently raise the peel everywhere from the body of the orange, taking care not to break any of the ribbons. Great patience is necessary, but at last we get the figure shown in the picture; and if we are careful we can remove the orange from inside, piece by piece, or, if we do not wish to do this, we can let it remain and wither with the peel.

Another artistic method of peeling an orange is to cut it all round the centre up and down in small v's, or in squares like the key pattern, then to pull back the peel carefully and release the orange so that we get two cups in the shape of a rose-bowl. In cutting and peeling oranges in these fancy ways one or two important points must be remembered and carefully observed.

First of all, we must choose a large orange, and it must not be over-ripe; it should have a smooth skin and no blemishes. For the cutting we must have a sharp knife with a fine point and take care not to cut too deeply. But with a little care and patience any clever boy or girl can become quite expert in fancy orange peeling, and able to invent new and artistic designs.



The different stages of cutting the peel of an orange to produce the artistic effect shown in the above picture

THE GAME OF ZOO-GUESS

EVERYONE at a party was trying to think what a Zoo-guess could be when the door opened and a maid brought in a big board with two sheets of white paper pinned to it. She placed the board on two chairs at one end of the room. At the other end Etta's mother sat at a table, and in front of her the children saw a bundle of little pink envelopes.

"First," the mother explained, "every boy must choose a partner.

"Now," she said, "I want two couples to come first. The boys will take these black chalks, and stand by the board. The girls will stand by me at the table. I shall give them each an envelope, and when I say Go! they must run to their partners and give them the envelopes. The boys will open the envelopes, and they will find pieces of paper inside with the names of animals written on them. Then, as quickly as possible, they must try to draw the animals on paper, while their partners watch. The moment the girls can tell what the boys are trying to draw, they must run to me and tell me what the animals are meant for, and the girl who gets to me first will win a prize."

Two boys, with the black chalks ready, stood by the board, and their two girl partners stood at the table.

Etta's mother gave each girl an envelope, and said: "Now run as quickly as you can, and remember that the girl who gets back to me first, wins." Then she called out: "One, two, three—go!"

Both girls ran as hard as they could down the room till they reached the boys.

The boys read the names of the animals and then tried to draw them, but first they only made marks that did not seem to mean anything.

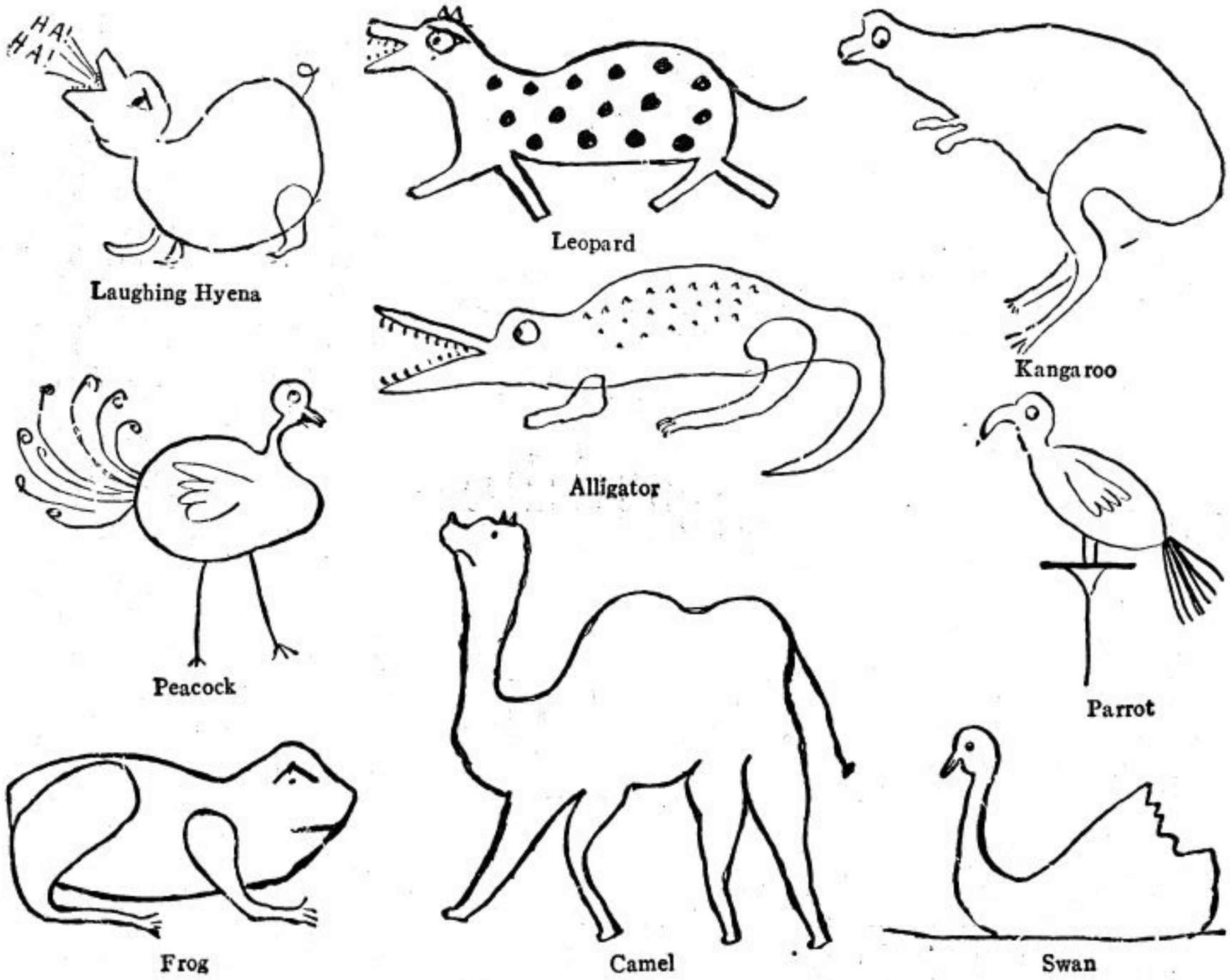
Then one of the girls saw a curly line that looked something like an elephant's trunk, and, without waiting for anything more, she rushed back and said: "It's an elephant."

"Wrong! Go and look again."

The girl ran back to her partner and she saw now that the curly line she had mistaken for a trunk was meant for a swan's neck, but before she could run back the other girl had guessed what her partner was doing, and won.

Of course they made mistakes, because they were so anxious to tell Etta's mother what the animals were, and win a prize that they began to guess the moment they saw something they thought they knew.

Sometimes the two girls would guess what their partners were trying to draw at the same moment, and then there would be a tremendous race down the room. These races were really the best part of the fun, because sometimes the girls got so excited that when they got to the table they could not say the animal names properly.



SOME OF THE ANIMALS THE CHILDREN HAD TO GUESS

WHAT TO DO WITH REELS AND BRICKS

If we save all the empty cotton-reels and put them into the playbox, we can spend many happy hours playing with the reels and a box of bricks. When not in use we can keep the reels on a piece of string to prevent them from rolling into out-of-the-way corners. One of the most interesting things we can make is a little bridge to span a river.

First we must pick out ten fairly long reels to form the supports of the bridge. These reels we must soak in hot water to loosen the paper labels, which can then be scraped off. We place the reels on end in five couples at equal distances apart, and join them up with long bricks, or a strip of card, cut the width of the two reels, which is long enough to span the river and rest on the banks. We can build up bricks to support the ends.

The card can be nailed to the reels with tin-tacks near the edges, and if we care to make parapets, two strips of card can be bent at right angles and the bent part glued down over the heads of the nails. This little bridge will be fairly substantial, and real water can pass under it, while over the top we can run a toy motor-car or train.

If we place four long empty reels on the table, two and two, on their sides, they suggest to us the possibility of making a pair of roller skates. A piece of thick wire must be bent round each end of the narrow central part of a reel, and a thin sheet of tin, such as we can get from a preserved fruit or meat tin, should be shaped like the sole of a boot and kept in place by the wire coming up from the reels. Black tapes can be used for straps, and drawn under the tin near the wheels. A small glass dish, such as that in which potted meat is sometimes sold, might be tied on to the tin, filled with flowers and placed on the table, where it will make a novel flower-vase for pansies or other short-stalked flowers.

Another little toy, a miniature chariot, can be made with two long reels, as long as we can get, placed on their sides, one in front of the other. On the central part of the reel we lay a flat piece of wood from the box of bricks, or a piece of cardboard. This we can secure to the centre of the reels with string. A sloped piece of card is then glued round the front of this, as shown in the picture.

We can make the chariot bright by covering it with silver paper. This serves as a very pretty holder for a glass of flowers. In a similar way, a trolley such as railway porters use can be made by leaving out the card at the front, and adding parts of wooden skewers for handles.

Three long, narrow reels can be placed one on top of the other in piles, arranged eight in a row in front, eight at some distance behind in line with the others, and the intervening space along each side filled with fifteen piles. Having built up the columns we place a row of bricks along the summits, place triangular pieces of card at each end to support two large pieces of card which will serve for the roof, and we have a rough copy of the Parthenon at Athens.

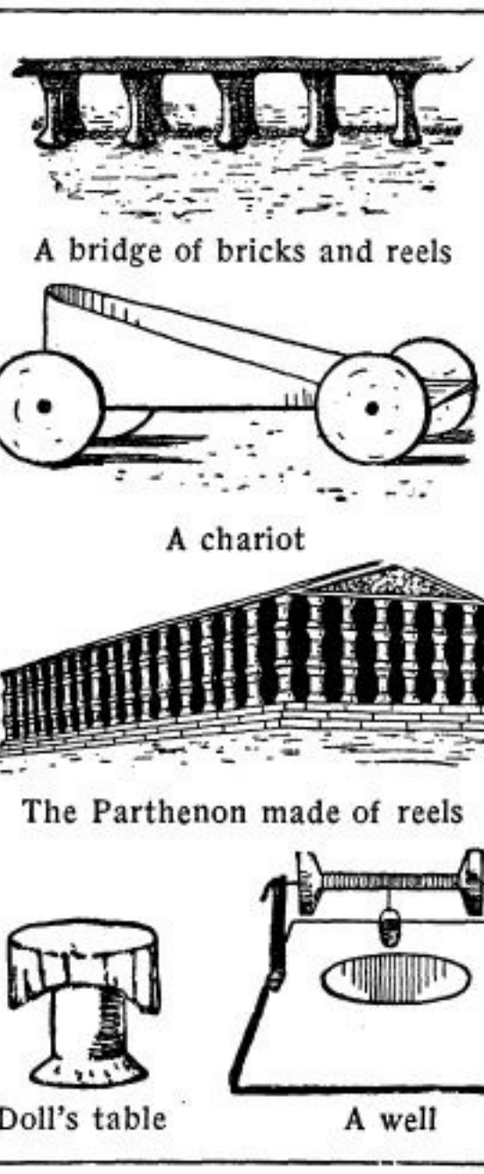
There are plenty of old churches in London and other cities built in this Doric style, which we can also imitate. A church steeple ending in one reel, with a wire or pin weathercock inserted in it, is simple to construct.

Another thing to build with our reels is a tower, and for this we want plenty of long, narrow reels. After making a brick foundation, we place a dozen or more reels close together in the form of a circle, and lay a disc of brown paper or card between each circle until seven tiers are built up, using fewer reels as we ascend. If we are skilful enough to place some of the discs a little on one side, we can imitate the tilt of the Leaning Tower of Pisa.

Other reels besides cotton-reels may be available for making small toys. The spools on which wire is wound make good wheels for a child's go-cart or mail-cart, for example. We can make quite an elaborate toy in the following way. A wooden skewer, cut to a suitable size, is wedged into the central hole of a long reel, and is supported at the two ends in grooves of two upright pieces of wood which are glued to a piece of card with a circular hole in the middle. Two long, stout pins are hammered into the ends of this wheel, and bent at right angles to form two handles used in winding and unwinding a thread rope, to which a little bucket is attached. A thimble, with a piece of wire encircling the rim and forming a handle, does nicely for this purpose.

Twine or coarse sewing thread will do for the rope, which should now draw up bucketfuls of water out of a tumbler over which the little well-head may be placed.

There is practically no end to the number of toys that can be made out of reels by any ingenious boy or girl.



A bridge of bricks and reels

A chariot

The Parthenon made of reels

Doll's table

A well

SCHOOL LESSONS

Simple Learning Made Easy for Very Little People

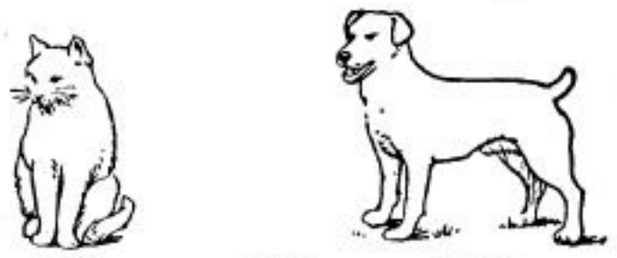
READING—JOINING WORDS TOGETHER

Now, children, said Mother, we have learned a lot of words which have pictures, like mat, hen, and cat, and we have learned a few words in our Nursery Rhymes which have no pictures, but we have only learned these words either with the picture or the rhyme to help us.

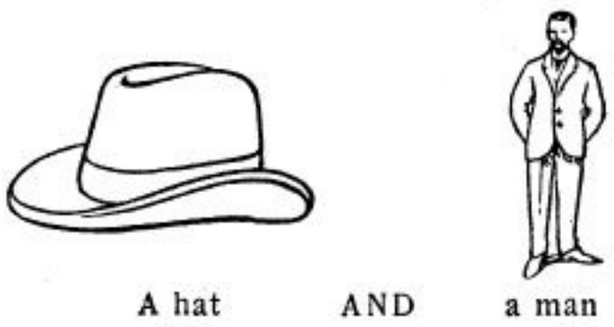
Now we must learn those words away from the picture and the rhyme, learn to make them into tiny new bits of reading.

AND THE FOR IS SEE

Some of these words we can call joining words, if you like, because they help to join words together into a little story ; and we can learn new words, too. We will draw little pictures of the story whenever we can, because that is always a help.



A cat AND a dog



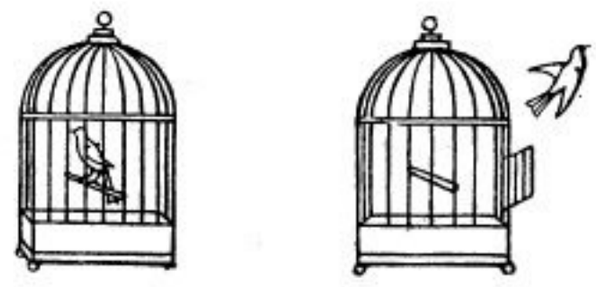
A hat AND a man

Now see if you can read these little lines without looking at the pictures. If we can't read them all, then we will look. Some of our words we have done before.

I can see a man and a stick, a hat and a dog, a cat and a bee, a flower and a bat and a ball. The hat is for the man, the stick is for the man.

IN OUT OF ON OFF UP DOWN SEE-SAW

I saw a bird in a cage and out of a cage, under the line and over the line, on the wall and off the wall. In and out. I saw Jo and Flo on the see-saw. Up and down. Up and down.



A bird IN a cage A bird OUT of a cage

I HE IT WE NOT JO GO NO ME SHE YOU THEY HAS FLO SO PLAY

The next little words we are going to learn are very useful ones, said Mother. They stand instead of other words. Listen to this and tell me if you like it : Billy laughed and Billy cried. Do you say that ? No, we say : Billy laughed and he cried. Betty danced and she fell down. Now let us learn them with some pictures.

Here is a little reading story with these words and some old ones.

You and I can go to play, so can Jo and Flo. Can a box go to play? No, it can not. Jo has a hat and Flo has a hat and they go out. We go and they go. Has a box a hat? No, it has not. Can a hat play? No.

Now tell me if this sounds right, said Mother: Bobby is eating Bobby's apple. Oh, no, we say; Bobby is eating *his* apple.

his her your my our

Well, now let us learn those little words. If we say Jo's apple, we put 's after Jo. But we say his instead of Jo's next time.

Here are some new words:

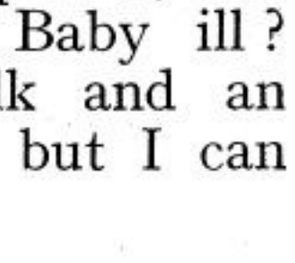
have make from here much bit eat give take bone there little drop meat Baby took ill plate some milk plate

And here is a little story:

I have a cup of milk. Can I give a drop to my cat? Yes, give her a little drop. Do not give her too much. I have an apple. Can I give a bit to Baby? Oh, no, it will make her ill to eat an apple.

We have some meat. Can Baby eat a bit? Oh, no, meat will make her ill. She can not take it.

Here is Fido with a bone. He got it from a plate and there is a lot of meat on it. No one gave it to him, he took it, but we will not take it from him.



When Billy and Betty had learned the last four picture-stories, Mother showed them a clever way of reading them again by making new stories. She said, I will point to the words here and there, and see what new stories we can make.

Baby got a bone from a plate. Fido got some milk from a cup and he gave some of it to my cat, and he took a little drop of it, too. Will an apple make Baby ill? Yes. I can take milk and an apple and some meat, but I can not eat a bone.

WRITING—LETTERS WITH TOPS AND TAILS

I HAVE thought of something new for you to do this morning with your capital letters, said Mother. You shall write in the kitchen for a change, on that little table by the window.

The twins thought that would be fine. They always liked to go into the kitchen, because when Mother or Jenny (Jenny was their little servant and a great friend of Betty and Billy) was making pies or cakes she used to make little sweet cakes for them out of the odd bits left over from the mixing. They tasted so good just out of the oven!

And what are we going to write, Mummy? asked the twins.

Ah, that is the secret, said Mother. Bring in your boards and the other things, and then you will see what Jenny and I have got for you.

And when they came in they saw, on the little table by the window, Mother's neat blue tins all in a row, those that hold nice things to eat, or to cook with, such as sugar and spice, and all that's nice, and have the name printed on the outside.

TEA COFFEE COCOA

After these they found some more tins and jars with names printed on the tin or on paper labels. So they copied these

FLOUR BOVRIL BREAD

After this they used to go round the house, finding out all the things that had a name on, or some letters, and copying them.

Now, said Mother, we must learn to write some letters with tops and some without. Let us call them tops and middles.

First we will do some things that we play with.

ball doll drum

Then some things that we wear :

hat coat boot

Then some things that we eat :

bread butter fish

Now we will do some letters with middles and tails :

pan jam can

Now we will write a few words whose letters have tops and tails as well as middles ; so we shall have to go up and down too, all in one word. And the things we write about will be easy to draw.

flag-pole, lamp-post

When Billy and Betty had been writing some time, Mother noticed how very ragged their little dusters were getting. And as to the sponges, why there was hardly anything of them left !

I suppose you try so hard to get your writing straight that you keep on rubbing it out, Mother said.

Betty and Billy looked at each other, but they didn't say anything out loud. No, but what they said inside was : We *love* rubbing out, don't we ?

Mother said the time had come for them to do without sponges.

I want you both to do for me, she said, a whole board full of writing without any rubbing out at all ; and if it is very, very straight, and if all the letters are quite the right shape, I will think out something new.

On the board Mother wrote : DO NOT RUB.

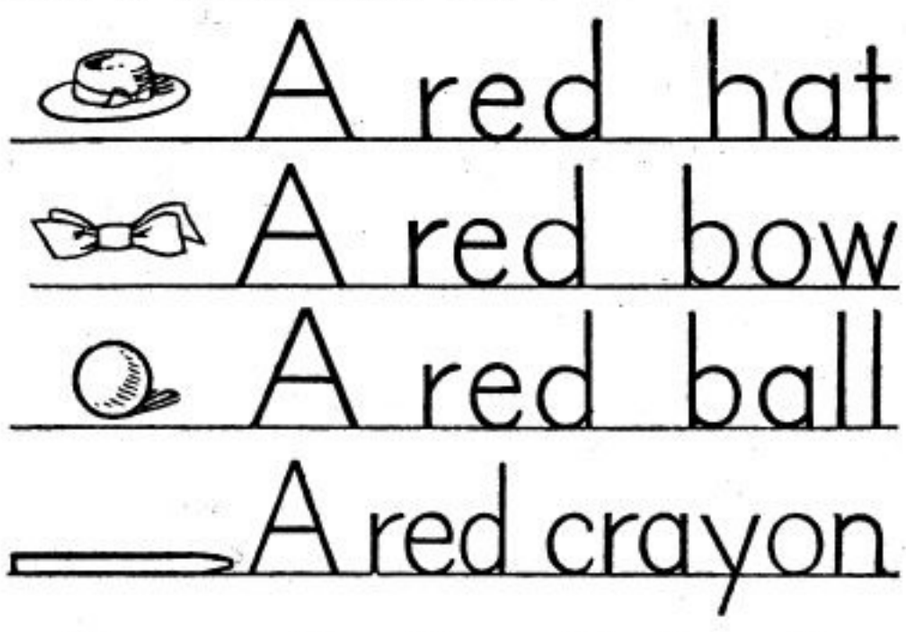
The twins laughed. They did it all down their boards, and when Mummy saw it she said it was very good, but they must wait until tomorrow for the surprise.

Next morning, when they sat down to lessons, Mother brought out two nice boxes of crayons—such pretty colours—and two packets of smooth sheets of brown paper.

Now, she said, you must learn to write very carefully, because you can't rub out the tiniest mark without making a nasty smudge. And, another thing, we must write a little more now, and so we must draw our lines closer together.

When Billy asked : What shall we write about ? Betty said : Let us write about our pretty crayons and their colours. Let us choose one colour and make some tiny pictures of things of that colour, and then draw the words. Mummy can tell us how to spell the words we don't know, while she does her sewing.

So they chose a red crayon, and this is what they did :



Now on the other side they drew the same things in blue.

Then they took a new sheet and did some different things in white. They wrote : A white cup, and a white saucer, a white mug, and a white jug.

On the other side they drew a little flag, and wrote under it : Three cheers for the Red, White, and Blue.

COUNTING—ADDING SMALL NUMBERS TOGETHER

MOTHER said that as they had had a chat about each number by itself, it was time they learned to add numbers together.

When we add together two numbers, she told them, it is easy to "take away," too; but it will be best to learn to add numbers first. Let us look round the room and see how the things in it will help us. Let us do quite little numbers first, like 2 and 1, or 1 and 1, or 2 and 2.

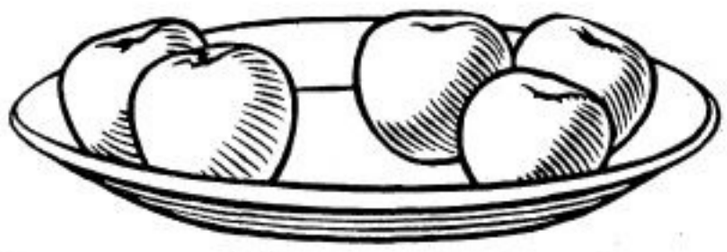
Billy said: There are three pictures on that wall, one in the middle and two at the sides, so 2 and 1 are 3.

Betty said: And there are 4 pictures on the other wall, 2 on each side, so 2 and 2 are 4.

Their Mother said they were quite right, and now they were to find some more things to add.

They looked at the fruit dish, and saw 3 large pears and 1 small one. So 3 and 1 are 4.

And then they counted the biscuits in the tin. There were 4 large and 1 small one, so 4 and 1 are 5. Then they saw some apples on the sideboard and Mother told them to put them in two lots, one lot on each side of the plate. So they put 3 on one side and 2 on the other, and they saw that 3 and 2 are 5.



The next thing to do, Mother said, was to learn how to write all this down, because then they could make up quite a lot of little countings for themselves.

When numbers are added together the big number they make is called the "sum"; that is why these little countings we write down are called SUMS. Now fetch your boards and chalk, and let us do some sums.

When the twins came back Mother had two little boxes ready for them, and they were full of pretty coloured counters. Mother told them to watch her while she counted 2 and 1. She put the counters like this:

The twins read out: 2 and 1 are 3.

Now, Mother said, we can't be always writing words in the middle of our figures, so I will show you two little marks which will do instead. + will do for AND, and whenever you see it it means ADD. And = will do for ARE. It really means "is the same as," and the hard name for it is equals.

That is enough counting for today, said Mother, and as you have fingered the biscuits I think you had better eat them. You may have 2 each, and Fido may have 1. So Billy and Betty and Fido had a nice little lunch and the twins said it would be good fun to count if they could always count biscuits.

When Daddy came home he asked them a lot of little questions. Some of them were rather funny ones, like these:

How many beans make 5?

Which is most, a pair of cuffs or a pair of gloves?

Which would you rather have, 4 sweets or 2 sweets?

A boy and a milking stool. How many legs?

A chicken and a hen. How many legs?

Then Daddy asked them some more little questions, and they had to think well before they answered.

2 boys and 3 girls. How many?

The twins said 5, but Daddy said: 5 what? 5 boys or 5 girls? And so they said: 5 *children*, of course.

2 dogs and 2 cats? 4 animals.

4 roses and 1 tulip? 5 flowers.

3 flies and 1 bee? 4 insects.

2 lemon drops and 3 chocolates? 5 sweets.

So Billy and Betty learned not to count together numbers of things which are different from each other.

MUSIC—THE FAIRIES IN THE TULIPS

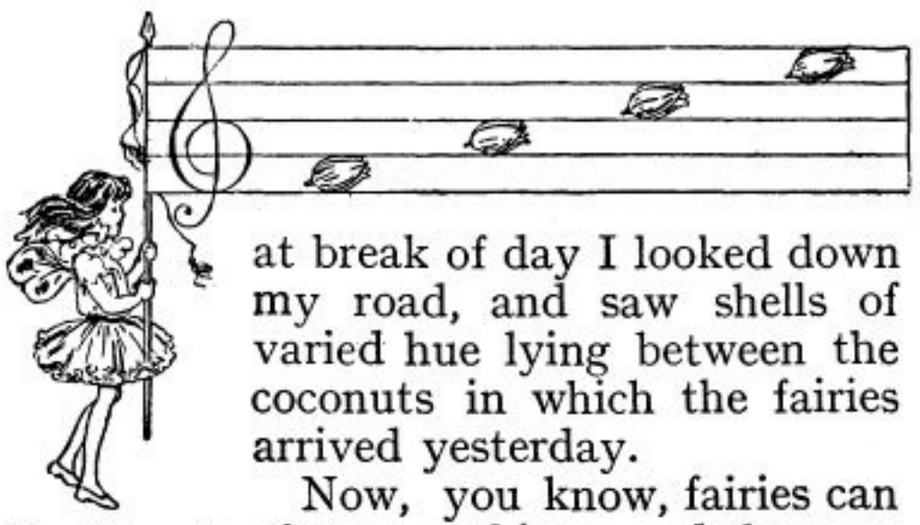
WHEN once we begin to let fairies talk to us, it is quite wonderful how much we learn from them, and how many new things they will show us.

We have let them introduce us to the Treble Road and the Bass Road, and already we have seen a fairy procession in wee motor-cars, and a fairy meeting when the fairies arrived on the scene in coconuts.

The motor-cars are still waiting in the Treble Road, and the coconuts are still to be seen in the Bass Road. But even now there are more fairy wonders in store for us.

One morning Treble Clef was heard telling Bass Clef that her road was prettier than it had ever been, for, curiously enough, in the night beautiful flowers had grown in the spaces between the motor-lines, flowers of different colours, very much like the shape of tulips.

Indeed, that is strange, answered Bass Clef, for when I opened my eyes



at break of day I looked down my road, and saw shells of varied hue lying between the coconuts in which the fairies arrived yesterday.

Now, you know, fairies can do all sorts of strange things, and they are very fond of big surprises. We heard the other day that they shut themselves very closely in their little cars to protect themselves against the weather. And so, when the coconuts arrived on the scene, we heard the fairies' voices, but still we could not see them.

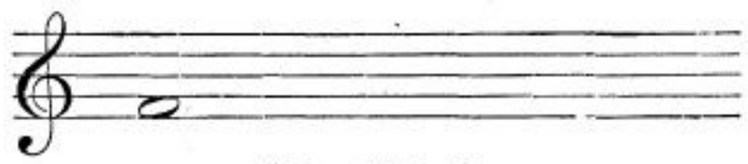
Sometimes, we shall find, they can sing to us out of several of their houses at once; sometimes they will leave one of their houses and sing to us from the door of another; but we always have to be very wide awake to understand what is really going on.

While Treble Clef and Bass Clef were having their little talk, the sun whispered the fairies' new secret to Treble Clef and the wind told all she knew to Bass Clef.

The fairies thought Treble Clef had managed their procession so nicely that they would give her a treat, so they decided among themselves that when she woke in the morning she should see beautiful tulips growing in the spaces between the motor-lines, and Fairy F, Fairy A, Fairy C, and Fairy E said they would go and stand inside the tulips, and sing when the right *note* was pressed on the piano.

Do you notice that the little white door is called a *note?* The gentle fairies think we are getting to understand them so well that we can begin to speak their language, and they call these little white doors, and the black ones too, *notes*. We remember that Fairy E's motor-car stopped on the first line, and directly she arrived there we had to go to the piano and press the next white note but one on the right of Fairy C's middle home. Treble Clef now says that if we go to the little white note on the right side of Fairy E we shall find out about the flower in the first space. Directly we press the note we hear Fairy F's voice.

The very first space I chose for rest,
Henceforth 'tis known as Fairy F's nest.

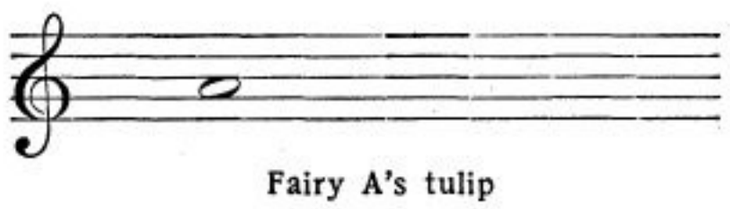


Fairy F's tulip

What about the second flower? we ask our friend Treble Clef.

As usual, she sends us to the piano, saying, You remember which little white note told you about Fairy G's motor on the second line; well, the very next white note on the right of Fairy G is the one to press if you would find out about the flower in the second space. We find the note quite easily, as it lies between the Fairy G and Fairy B. Press it down gently.

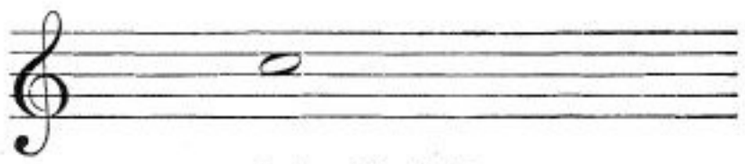
Who's in the second space? you say,
And a little voice answers, Fairy A.



Fairy A's tulip

Now we come to the third flower. If we would understand this flower we must go to the white note on the piano which lies between Fairy B's motor on the third line, and Fairy D's car on the fourth line. Let us press it down gently and listen.

Rat-a-tat-tat! at space Number three;
Who is at home? It is Fairy C.



Fairy C's tulip

Still there is a fourth flower, and again we turn to Treble Clef. She tells us we can find out all about it if we go to the piano and press the little white note lying between Fairy D's motor on the fourth line and Fairy F's motor on line number five. So without more ado we go to that little note.

Space number four for wee Fairy E,
Tulip and I as good as can be.

Fairy E's tulip

All the fairies are so happy that those in the motor-cars and those who are nestling in the petal of a flower join together in another fairy rhyme:

On lines one, two, three, four, and five
E G B D F arrive;
Then F A C E come between,
In the four spaces we have seen;
Here on the treble stave we've spied them,
With little Treble Clef to guide them.

What a beautiful game of play we can have! No less than fourteen little fairies will play with us.

G B D F A are to be found in their coconuts on the five lines in the Bass Road. We must run to press down each note and see how quickly we can find them. E G B D F enjoy being in their motor-cars on the five lines in the Treble Road.

Now for the little fairies who love their tulips in the four spaces between the five lines in the Treble Road.

F in the first space.
A in the second space.
C in the third space.
E in the fourth space.

DRAWING—PAINTING A SPRAY OF LEAVES

This time we are going to draw and paint a spray of leaves. First we must find a spray. Any kind of leaves will do, but it is better to begin with those that are called evergreens—laurel, ivy, box, or even yew. This is because all leaves and flowers change very quickly, especially after they are picked; and, unless you are clever, they will alter almost before you have time to begin, and this is very confusing when you are trying to copy them carefully.

You remember when we drew the twigs how the stalk was thicker where each little bud grew? Now you will notice that wherever the leaf springs from the stem there is a swelling; some times it is bigger than at others.

The stalk of the leaf is not the same thickness all the way down, and some kinds of laurel leaves are rounded at the tips and where they join the stalks, and others are pointed. Whichever kind of leaf we have chosen, we must look at all these things and notice the different shapes, because today we want to try to draw from memory a single leaf with its stalk before we copy the spray.

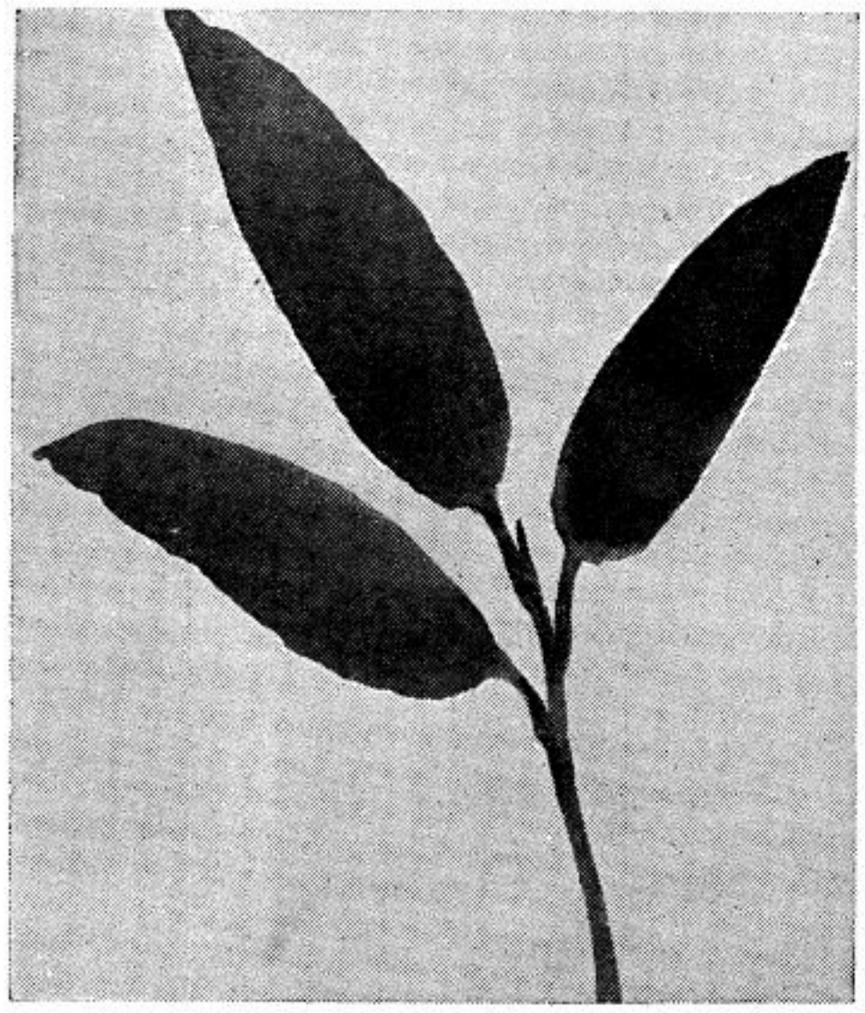
When we think we can remember it quite well, we should hide it away somewhere, and then get out our drawing things. Let us number them.

1. The drawing board and pins.
2. The black and the white chalk and brown and white paper.
3. The jar of clean water, the sponge, the paint-box and brushes, and two B pencils—one with a chisel point and one with a sharp point.

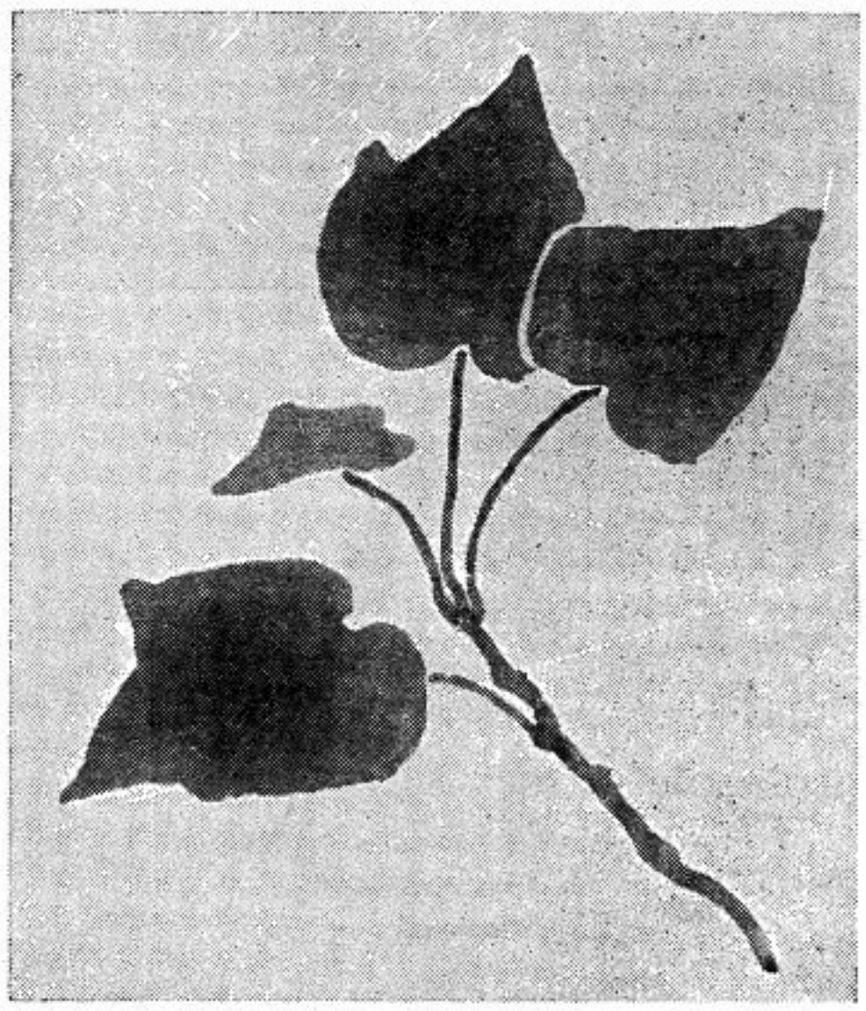
Now draw the leaf from memory, with its stalk, on brown paper in black chalk, or, if you like, on white paper. Draw several if the first is not a good one; then get your leaves, and see if you have remembered well what one of them was like. See if you have drawn it large enough or too large; if the tip is the right shape; if it joins the stalk properly. Then copy carefully a leaf by itself. You cannot put in the veins nicely with the black chalk, so do not try. It is better to do this with the pencil afterwards, or even to leave them out altogether till you have had more practice. They are so fine and delicate that they must not be made to look as if they were coarse and hard. The veins are just little hollow pipes which carry the sap to feed the leaf, so they want very careful drawing.

Now we will try the spray. Put it on the paper first, and see about how much

space it takes up. Put a dot where the tip of each leaf comes on the paper, and where the small stalks and the big stalks begin and end. If you have not drawn stalks and leaves before, this way will help you, but do not always use the dots; you will not learn to draw so quickly if you do. Put the spray on the left-hand side, and begin with the big stem. Notice if it curves or bends, then draw the leaf-stalks and then the leaves themselves.



Now we have to make a copy of our laurel leaves, painting them straight away on white paper.



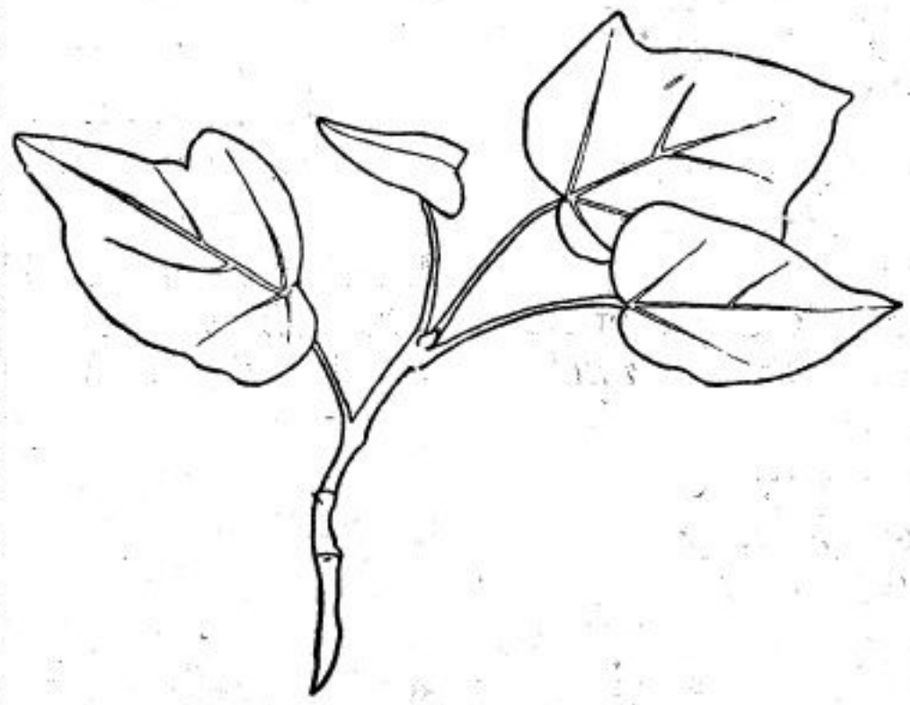
Here is a picture of a spray of ivy leaves painted on white paper. Remember to start with the stalk.

We shall find it better not to draw the leaves with a single line round them at first, but to rub the chalk sideways on the paper, getting the direction the leaf takes carefully, and drawing it big. All other leaves must be drawn in the same way, beginning first with the long stems.

We can practise drawing the spray with a brushful of colour in green paint to match the shade of the leaves, or in brown or black paint like the pictures above. Moisten the paper with the damp sponge first. If the paper glistens when you hold it level with the eye, it is too wet.

A good, bright green is made by mixing Prussian blue, gamboge, and burnt sienna. A good dark green is made by mixing together indigo and burnt sienna, or Prussian blue and Vandyke brown. We shall find that there are a great many ways of mixing greens when we know our paints.

If we are not tired of our spray by this time, we can try to draw it in pencil on white paper. We must draw the long stem first, just in the same way as we began with the black chalk, but now the leaves must be drawn in *outline*. This is much more difficult.



This is a spray of leaves in "outline" in lead pencil on white paper. Use the chisel-pointed pencil and make the stalks and the biggest of the veins with double lines

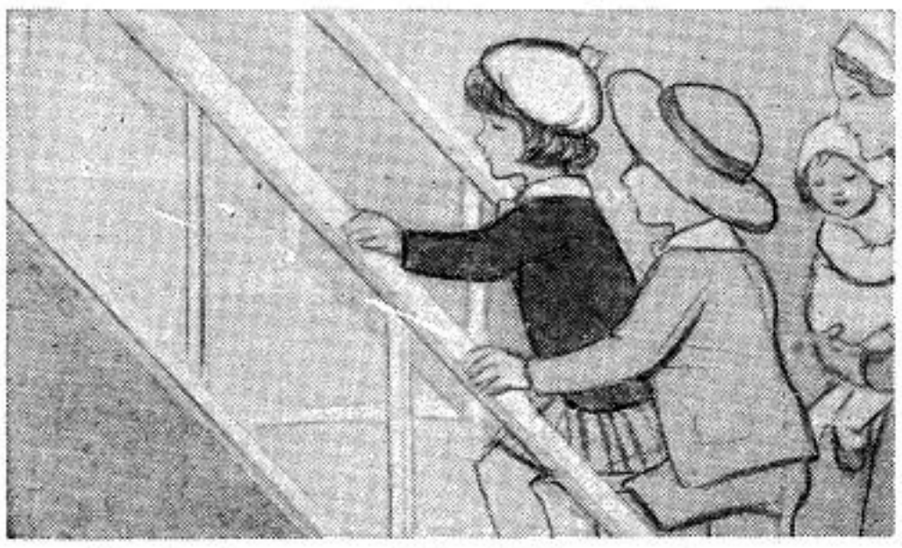
Use the chisel-pointed pencil first, draw lightly on the paper, and do not put your fingers close to the point, but well down the pencil. Use the sharp point to draw all the fine parts—the veins and the thin stalks.

Do not attempt to draw all the little veins, but only the big ones. Remember to make the stalks and the big veins double.

If we are painting autumn leaves we may tint them red and brown as they actually appear.

FRENCH—HURRYING TO THE BOAT

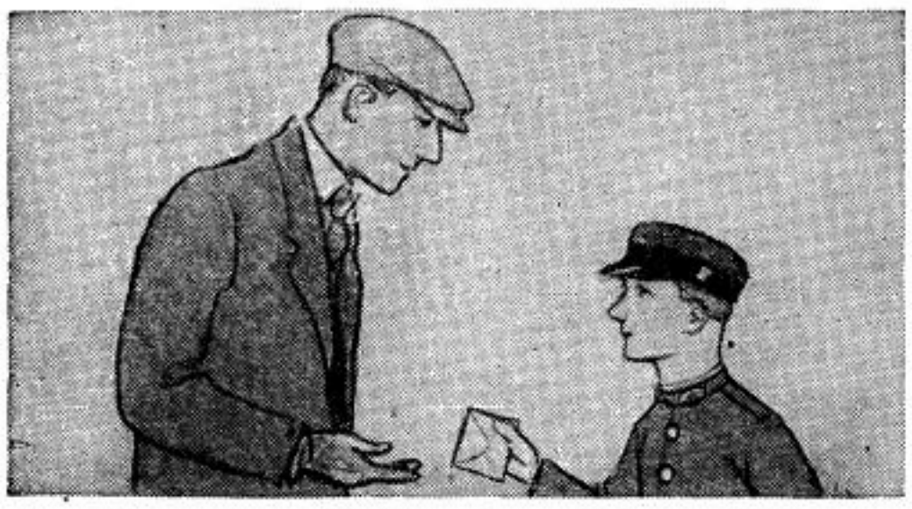
OUR story tells us here how the party make their way to the boat. In reading remember that the first line under each picture is the French; the second line gives the English word for the French word above it; the third line shows how we make up the words in our own language



Le bateau va bientôt partir
The boat goes soon to start
The boat will soon start

Il y a beaucoup de voyageurs
There are many of travellers
There are many travellers

Tout le monde se dépêche
All the world itself hurries
Everyone is hurrying



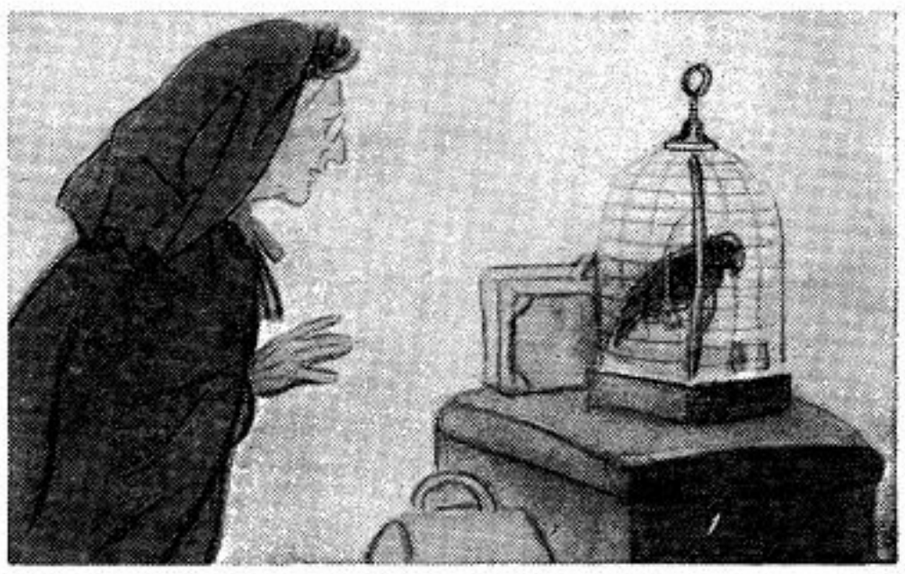
On crie : " Monsieur Hawes ! "
One cries : " Mr Hawes ! "
Someone calls : " Mr Hawes ! "

C'est un télégramme pour papa
It is a telegram for Papa
It is a telegram for Papa

Papa l'ouvre : c'est de notre oncle
Papa it opens ; it is from our uncle
Papa opens it ; it is from our uncle

Il nous souhaite bon voyage
He us wishes good journey
Hé wishes us a good journey

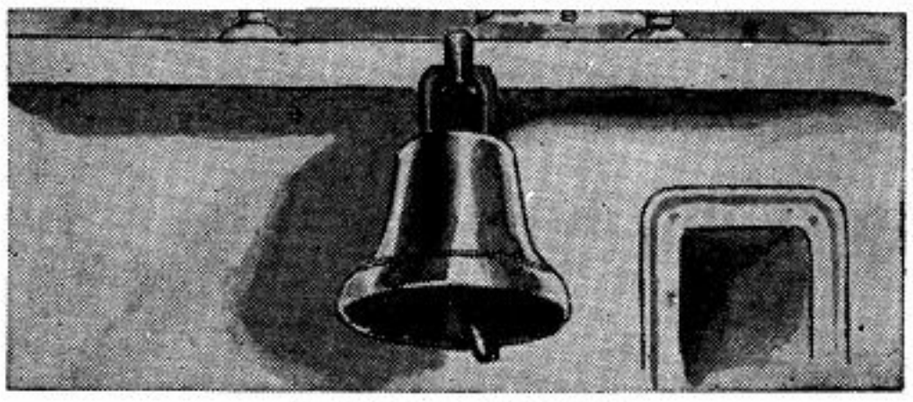
Nous sommes enfin sur le bateau
We are at last on the boat
At last we are on the boat



Une vieille dame a perdu son perroquet
An old lady has lost her parrot
An old lady has lost her parrot

La bonne aperçoit la cage
The nurse sees the cage
Nurse sees the cage

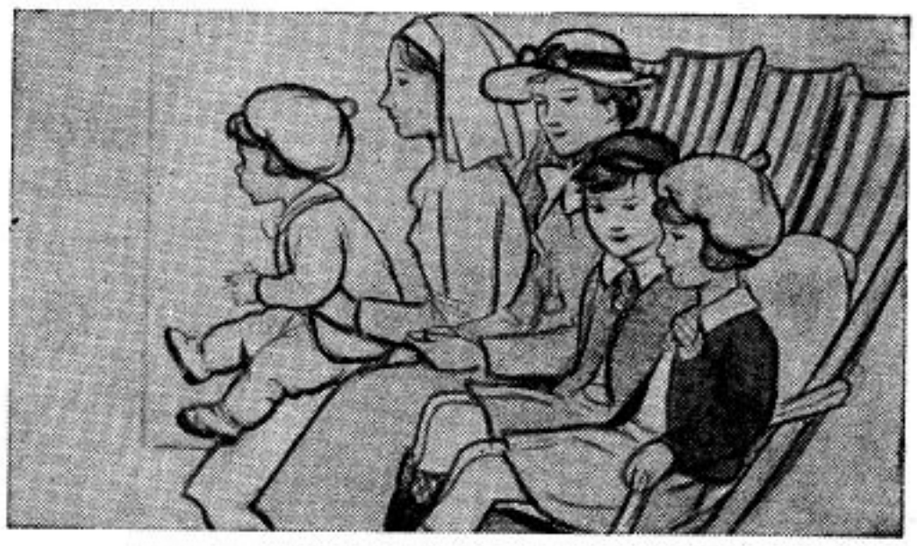
La dame est enchantée
The lady is delighted
The lady is delighted



La cloche—The bell

Il y a un bruit épouvantable !
There is a noise frightful !
There is a frightful noise !

La cloche sonne. Nous allons partir
The bell rings. We go to start
The bell rings. We are going to start



Nous nous asseyons sur le pont
We ourselves sit on the deck
We sit on the deck

END OF VOLUME ONE

THE CHILDREN'S ENCYCLOPEDIA